...LY MAGAZINE FOR MANUFACTURERS & BUSINESSMEN

CALCUTTA, OCTOBER, 1949. No

ACCEPT

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THE MIRACLE MAN WITH UNRIVALLED POWER

India's Greatest Astrologer & Tantrik-Yogi

Raj Jyotishi.

JYOTISH-SHAMRAT PANDIT RAMESH CHANDRA BHATTACHARYYA, RAJ JYOTISHI, JYOTISH-SHIROMANI JYOTISHARNAV, M.R.A.S. (London) of International fame, President—World-Renowned All India Astrological & Astronomical Society. (Estd. 1907 A.D.) and Permanent President of Baranoshi Pandit Sabha (Benares) elected unanimously on 14 Feb., 1948.

He is the only Astrologer in India or even in the world who first predicted the Allies' Victory in the last world war on 3rd. Sept., 1939 within 4 hours the day of the declaration of war. This miraculous prophecy has earned for him praise and honour from His majesty King George VI, and Viceroy of India and the Governor of Bengal, similarly the wonderful prediction made by Panditji (Vide his Telegraph No. 19 of Hatkhola P. O. dated 3rd. Sept. 1946) about the future of Interim Govt. headed by our Great leader Pandit have already been proved correct.

In recognition of his profound scholarship, genious and Miraculous powers Panditji was honoured with tittle of **"Jyotish Shiromani** by All India Pandit Mahamandali in the gathering of hundred scholars all over India at Calcutta in December 1938 and again in February 1947 with greatest of all titles in Astrology "Jyotish Shamrat" in the presence of 250 scholars all over India at Benares in the Annual Conventions of Baranashi Pandit Maha Sabha. No Astrologer in India has received this signal honour in the annals of India till to-day, who is also the consulting Astrologer of the **Eighteen Ruling** Chiefs of India.

It is well-known that the Astrological predictions of this great scholar, his wonderful methods of redressing the pernicious influence of evil stars, his power to bring success in complicated law-suits and also to cure incurable diseases are really uncommon. Many eminent personalities of the world (**England, America, Australia, Africa, China, Japan, etc.**) have given many unsolicited testimonials of the great Pandit's wonderful powders.

A FEW OPINIONS AMONGST THOUSANDS.

His Highness The Maharaja of Athgarh says—"I have been astonished at the super-human power of Panditji." **Her Highness The : Dowager 6th Maharani Saheba of Tripura State** says :—"He is no doubt a great personage with miraculous power. **The Hon'ble Chief Justice of Calcutta High Court Sir M. N. Mukherjee, Kt.,** says:—"The wonderful power of calculation and talent of Sriman Ramesh Chandra is the only possible outcome of a great father to a like son." **The Hon'ble Maharaja of Santosh & Ex-President of the Bengal Legislative Council, Sir M. N. Roy Choudhury, Kt.,** says :—Onseeing my son, his prophecy about my future is true to words. The **Hon'ble chief justice Mr. B. K. Ray of Orissa High Court** says :—"He is really a great personage with super-natural power." **The Hon'ble Minister, Govt. of Bengal, Raja Prasanna Deb Raikot** says :—"The wonderful power of calculation and Tantrik activities have struck me with greatest astonishment." **The Hon'ble Justice Mr. S. M. Das, of Keonjhar State High Court,** says :—"Panditji has bestowed the life of my almost dead son." **Mr. J. A. Lawrence, Osaka, Japan,** writes :—"I was getting good results from your Kavacha and all my family were passing a different life since I started wearing." **Mr. Andre Tempe, 2723, Popular Ave., Chicago, Illinois, U. S. America :**—"I have purchased from you several Kavachas on two or three different occasions. They all proved satisfactory." **Mr. K. Ruchpaul, Shanghai, China :**—"Everything you foretold in writing is taking place with surprising exactness." **Mr. Issac Mumi Etia, Govt. Clerk & Interpreter in Deschang, West Africa :**—"I had ordered some Talismans from you that had rendered me wonderful service." **Mr. B. J. Fernando, Proctor, S. C., & Notary Public, Colombo, Ceylon:**—"I got marvellous effects from your Kavachas on several occassions" etc. etc. and many others.

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INDUSTRY.

A Monthly Magazine for Manufacturers and Businessmen.

Published in the first week of the month by
INDUSTRY PUBLISHERS LTD.,
22, R. G. Kar Road, Calcutta-4.

EDITORIAL CONTENTS FOR OCTOBER, 1949

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INDUSTRY PUBLICATIONS

Editor:
K. N. Banerjee.

VOL. XL. CALCUTTA, OCTOBER, 1949. No. 475.

REBUILD EXPORT TRADE

WITH reserves of foreign exchange dwindling and the industrial production being handicapped a good deal due to a shortage of raw materials like cotton and jute, India needs to do some hard thinking on how best these drawbacks can be removed.

There are no two opinions in the country—and rightly so—that neither foreign exchange nor raw materials can be had from outside merely on asking for them. Whatever the prospects of assistance from abroad, we should do well to note that we shall have to earn what we need.

And by "earning" we mean sending out whatever we can spare and for which there is a demand in the markets of the world—against the foreign currency and goods we feel we ought to have for our requirements.

In more simple words, it means we should rebuild our export trade. We should recast it and remould it and thus help it develop in the proper manner and in consonance with the country's national needs in materials, plants and machinery and foreign technical help. Things are fast going out of the gear and it is imperative that further deterioration be checked in time.

It will not do to say that India does not have at present any exportable surplus worth the name. Of some articles at least we have got an exportable surplus like say, cotton textiles and jute manufactures.

And yet our exports are diminishing. The phenomenon should be properly analyzed and the lacunae in the present set-up accurately spotted.

Our goods do not sell well in the foreign markets for two principal reasons. First, their prices are high and uneconomic compared with the prices of similar articles turned out by other countries. Second, their quality is unsatisfactory. There are also defects like insufficient advertising and publicity campaigns.

The need of the hour is to modernize production. Scientific trading is called for as also production on a mass scale. To fulfil this objective our industrialists will have to think big and plan their commercial activities in a progressive manner. They should shun their almost incorrigible vice of moving down the set grooves.

(Continued on page 288).

—CURRENT TOPICS

SUGAR RACKET TO BE COUNTERACTED

India's sugar industry is believed to have abused its rights to protection enjoyed by it for a considerable period. Ever since the Government discontinued the rationing of sugar, the price of this important food item has been steadily rising, going beyond the reach of the average consumer's purchasing power. It is indeed a major surprise that the prices could rise by baffling all normal economic laws despite the fact that the stock position of sugar was not bad nor had there been any spectacular rise in the demand for the commodity within the country. Rather due to its uneconomic prices Indian sugar remained locked up within the country and even a neighbouring country like Pakistan was in no mood to import sugar from India.

On behalf of the industry were pleaded the high cost of production and sugarcane cultivation. That the Government was not convinced by such pleas as these, is amply borne out by the talks of freezing the existing stocks of sugar and reintroducing sugar rationing. At the time of writing it is reported that the Government of the United Provinces have already taken a lead in the matter by freezing part of the available stocks. Spokesmen of the Government of India too have given the assurance that no stone would be left unturned to bring down the sugar prices.

The absurdity of the price position prevailing by the end of August last was evident from the figures published in the responsible press. Indian sugar sold at Rs. 40/- per maund; while imported sugar from the soft currency areas was somewhere near Rs. 17-8 per maund. Sugar in the dollar area was said to be cheaper still, being only about Rs. 11-8 per maund.

Despite the industry's one plea or another nobody could feel convinced that Indian sugar magnates and dealers were not setting up an inter-provincial racket to push up the price of sugar artificially. And rightly, therefore, the Government was urged to protect the interests of the consumers against the gross misuse of protective tariffs offered to the indigenous sugar industry with a view to promoting its growth.

It was clear by the beginning of last month that the Government of India were no more prepared to leave things at the mercy of sugar magnates. Under the Government's orders under the Essential Supplies Act, 1,50,000 tons of sugar lying in factories were frozen to check the rise of sugar prices. The Provincial Governments were advised to freeze stocks lying with the dealers estimated at about 100,000 tons. The India Government also issued a Press Note which said the Indian Sugar Syndicate had not been able to function in a rising market in a manner consistent with public interest. It was reported that the Government were even prepared to dissolve the Syndicate, if necessary. As with the sugar industry, this country's textile industry too behaved in exactly the same manner after the lift-

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(Continued from page 281)

It is time the Government and the Industry had decided to lay their heads together and make concerted efforts to change the economic face of India instead of bandying words over controls and taxes and multifarious other ills, real or imaginary.

ing of controls in January last. The Government were compelled to take drastic measures to pull it straight. At the time of writing there are no two opinions among the common consumers that the Government should not hesitate to go tough with the sugar industry and adopt immediate remedial measures till the imposition of rationing is possible to counteract all racketeering in sugar.

SHIPPING POLICY

Dr. Symaprasad Mookerjee, India's Industry and Supply Minister, came to Calcutta last month and speaking at a party on board the S.S. Indian Trader at Kidderpore, pointed out that India should not remain satisfied with the running of ships but aim at controlling and building her own.

Describing the Government of India's shipping policy the Minister said that the Government wanted that more Indian ships must take charge not only of coastal traffic but of international traffic as well. India is now thinking of launching upon a programme of shipbuilding. The task is no doubt difficult to be achieved, but some time or other a beginning ought to be made to help the country revive its once glorious shipping tradition.

Dr. Mookerjee did well in reminding his audience that India could not dispense with foreign help for the purpose of implementing her scheme of shipbuilding. It is a pity that even to this day a perceptible amount of xenophobia persists in certain quarters, but little do these short-sighted xenophobes realize the fact that India will have to depend, for at least a limited period, on foreign technical support and experience. This will not curb her freedom at all, but on the other hand lend meaning to it by strengthening her economy and pushing her ahead on the road to real progress and development. Dr. Mookerjee added that proper facilities would be provided for the training of Indians so that in due course of time India could have her own engineers and technicians for carrying on and controlling all technical work in operating ships or building factories.

Some time back certain French experts were asked to study the situation at Vizagapatam Yard. Dr. Mookerjee said that they had held that if the Vizag Yard was properly developed and looked after, it was bound to become in five years' time one of the best in the world. The Government of India, encouraged by the experts' views, may resume shipbuilding at the Yard.

COAL PROBLEMS

Speaking to the Calcutta Rotarians last month Dr. J. Whitaker, Director of the Fuel Research Institute at Dhanbad, said that coal consumption could be taken for an index of India's Industrial development or undevelopment. About 30m tons of coal are mined annually in this country, out of which the Railways consume nearly 10m tons. Engineering Works consume about 4.5m tons and an equal quantity is used by the iron and steel industry. India's iron and steel industry, as is evident from its low consumption of coal compared with the Railways, is really underdeveloped and so also are the engineering and other industries.

Dr. Whitaker drew attention to a deplorable fact, viz., that the Railways in India use good coking coal which had better be made over for use in other important industries. But the Railways do not deliberately waste coking coal for no other than steam raising purposes. Dr. Whitaker pointed out that the Railways were prepared to use cent per cent non-

coking coal, but transport difficulties stood in this way.

India's coal reserves are gradually diminishing and unless the drift to decay is checked by modernising the mining methods and by conserving coal of the superior variety, a time is bound to come when India will have to face an acute shortage of this important industrial fuel. Dr. Whitaker is fully alive to this danger. The Central Government too is not sleeping over the matter. A Committee has already been appointed to estimate the reserves of coal of the superior variety. Dr. Whitaker rightly insisted in his speech at the Rotary Club that coking coal should be used solely in metallurgical industries, particularly in the production of iron and steel.

At present India has to import from outside the major part of her oil requirements. Not more than 7 per cent. of these are produced in this country. Dr. Whitaker suggested that a ton of oil could be manufactured from five tons of coal. By producing oil from coal, he said, India could reduce her dollar expenditure to a considerable extent. Electrification of railways has been suggested by some as an effective method of conserving coal now being practically wasted by the railways. But this is a thing which can hardly be done immediately. For the present, therefore, all efforts should be directed towards modernising the mining methods and conserving the use of coking coal as much as possible.

UTILIZATION OF RESOURCES

Describing India's scientific efforts for the utilization of her resources, Dr. S. S. Bhatnagar, leader of the Indian Delegation to UNSCCUR (U. N. Scientific Conference on the Conservation and Utilization of Resources), made the following points:—

(1) MINERALS:—Drilling is needed to probe deposits of useful minerals. Arrangements are being made for the acquisition of drills and for training personnel in drilling technique, both for petroleum and other minerals. India is prepared to afford facilities to expert oil firms for oil exploration on reasonable terms. The Government of India is seriously investigating the possibilities of producing synthetic petrol.

(2) EXPLORATION:—A Geo-physical section has been constituted as part of the Geological Survey Organisation in India, while the seismic and gravitational methods have been used for over 15 years by the oil companies operating in India. The search for uranium and thorium, the raw materials from which atomic energy can be produced, is continuing and in this the Gamma-ray and Beta-ray counters are proving of great help. A rare mineral unit is functioning under the Atomic Energy Commission and Geiger-Muller counters have been constructed.

(3) FISHERIES:—The idea now prevailing is that India, Pakistan and Burma should carry out joint investigations to set up international units for the development of fisheries. One such unit, the Indo-Pacific Fisheries Council has already been established for South-East Asia and Australia, with its office at Bangkok (Siam).

(4) IRRIGATION:—India has a well-developed irrigation system, but it was built up mainly by old techniques and unskilled labour. But now India is ready to construct the highest dam in the world—the Kosi River Dam and she will also make use of the most modern techniques.

WEST BENGAL TO HAVE NEW INDUSTRIES

West Bengal may soon undertake two important new industries, viz: deep-sea fishing and manufacture of salt from sea water. The province's Premier Dr. B. C.

Roy told pressmen last month that he had investigated the possibilities in this connexion during his recent European tour.

He said he had contacted the Danish Government to ascertain how far they could help West Bengal in providing trained men to undertake scientific deep-sea fishing and also equipments necessary for the purpose. By his own admission Denmark is prepared to send its experts to carry on the work during the initial period.

Deep-sea fishing, if and when undertaken, may go a long way towards removing one glaring defect of our national diet by making available to the consumers, fish at low prices. Fish is a very good source of protein and protein is a very valuable source of nourishment.

Dr. Roy has on his mind another important scheme relating to the manufacture of salt from sea water. At present West Bengal consumes about 35,00,000 maunds of salt per year, but does not produce more than about 30,000 maunds. Dr. Roy's aim is to make the Province self-sufficient as far as salt is concerned. During his European tour the Premier had an opportunity to study the workings of the biggest salt manufacturing factories in southern France. He proposes to utilize the same method as adopted in the French factories for the manufacture of salt in West Bengal, viz., the solar evaporation method.

Nearly six months ago it was reported that the Central Government and the W.B. Government might jointly float an Industrial Corporation for developing salt manufacture on the Contai sea coast in Midnapore. Under the Government scheme the area would be divided into three areas—Purshottampur, Deoli and Ramnagar. There is a salt manufacturing factory at Purshottampur and it was earlier proposed that the Government might finance it for promoting its developme[nt]. The proposed Industrial Corporation [it] was said, would finance salt manufact[ure] in the other two areas.

INDO-MALAYAN TRADE PROSPECTS

According to Sirdar Jogindra Sin[gh], the Indian Trade Commissioner [in] Malaya, the prospects for Indian goods [in] Malaya are greater now than ever. F[ew], however, will agree with him that [the] prestige of Indian goods is rapidly ris[ing] in the foreign markets. It will be rat[her] naively complacent to think that it is [so], especially in view of the fact that at p[re]sent our export trade is at a low ebb. T[he] Sirdar seems to stand on a firmer foot[ing] as far as his study of the trends of Indi[an] export trade with Malaya and other pa[rts] of South-East Asia are concerned.

The Indian merchants who have be[en] living in Malaya for generations are t[he] men who have popularized Indian goo[ds] in that part. But they need more help a[nd] encouragement from the Government [of] India to be able to carry on their wo[rk] more successfully. Much of their futu[re] in the land of their settlement will also d[e]pend on what facilities are accorded [to] them by the Malays themselves.

From Sirdar Jogindra Singh's rec[ent] address to the Singapore Chamber [of] Commerce it is gathered that Mala[ya] needs Indian cotton textiles, and man[u]factured products of various oils, wax[es], soaps, matches, glassware, sports goo[ds], carpets, silk fabrics, tea, coffee, enginee[r]ing products, pharmaceutical and medi[cal] preparations and fertilizers. Quite a lo[ng] and flattering list no doubt!

MANUFACTURE OF SYNTHETIC PETROLEUM

The question of setting up a synthe[tic] petroleum plant in India has now be[en] taken up seriously following a reco[m]

mendation of the Council of Scientific and Industrial Research in this regard. It is said that Messrs. Koppers and Co., have submitted a report on the project in the course of which is envisaged the establishment of a plant of a million-ton capacity involving an estimated expenditure of Rs. 55 crores.

Synthetic petroleum to be manufactured from coal, it is expected, will not cost anything higher than 7 annas per gallon, assuming that low grade coal costs about Rs. 6-11 per ton. In terms of gas, about a thousand million cubic feet of synthetic gas will be required daily, necessitating the use of approximately 15,000 tons of coal per day.

As for the location of the manufacturing plant, it is a necessity that it should be somewhere near the coal mining areas, for the manufacture will depend on a very abundant and speedy supply of coal. At present four sites are being mentioned: Ramgarh, the U.S. wartime base near the projected Maithon dam on the River Barakar, the Ondal area and Panagarh. All the four sites are in the heart of Bihar's coal area.

The Government of India are alive to the practical difficulties that it will have to face, if it launches upon an ambitious scheme of manufacturing oil from coal rightaway. It is prepared, however, to go slow in the matter. For one thing, the scheme is very expensive and also it will be in the nature of an experiment to try to produce oil from coal. Nevertheless, the scheme is worth implementing on a moderate scale. If it materialises India will succeed in reducing her dependence on foreign petroleum to some extent. Then again, by so doing India will save a good deal of foreign exchange, in particular, dollars of which she does not have a very large reserve at present.

—POTTERY INDUSTRY

POTTERY occupies an important place among the essential requirements of man, and its application has now extended to such an extent that it is difficult to realise the dependence of the various industries upon it. Without pottery there could not be the convenient employment of electricity we now enjoy; the production of corrosive chemicals, with all that depends thereon, would be reduced to an insignificant quantity; the production of high grade steel would be impossible; the use of crucibles for testing and refining purposes would remain unknown.

Egypt and Mesopotamia cradled the development of pottery. Extensive archeological studies of the valley of the Nile have shown that the Egyptians were quick to grasp the significance of any propitious accidents which befell a pot in processing the clay. That they were ingenious is demonstrated by the many discoveries and inventions made by them. Evidence shows the early use of the mould, the development of the potter's wheel, encaustic inlay, glazes and frits, and even the muffle kiln. The remains of a frit furnace have been discovered, showing the complete process as used by the Egyptians, and through a fortunate kiln failure the entire method of firing was left for the archeologist's spade.

Assyrians and Babylonians used terra cotta coated with various colours from very ancient times. The Persians learnt this art from the Assyrians and succeeded in improving it to a high degree of perfection. The Persian pottery were made from highly siliceous bodies coated with a transparent alkaline glaze.

In India clay products in various forms have been used since very ancient times. Recent excavations have shown that this art of pot making was in a fairly advanced state as early as 4000 years ago.

At the present time besides ordinary pottery, there are some artistic wares manufactured in several places of India. The chief centres of these art pottery are (1) Chunar, (2) Nizamabad, (3) Lucknow, (4) Meerut, (5) Khurja, (6) Moradabad, (7) Rampur, (8) Biswan, (9) Jaipur, (10) Krisnagar, etc. In Chunar this pottery industry is confined among several families. There is nothing remarkable in the methods of their work. The earth suitable for pottery manufacture is procured from neighbouring tanks and is thoroughly pounded and softened and all impurities are carefully removed before it is placed on the wheel. In Chunar the wheel is generally made of stone, which is available locally. Most of the roundish articles turned out at Chunar are fashioned on the wheel; moulds are also used to a small extent. The ordinary dark terracotta is produced with the power of a local red stone known as Ser. Metallic glazes are used.

The pottery of Nizamabad in the district of Azamgarh is a brown or black ware picked out with designs in white. The black or brown colour is imparted by a smoking process and the ornamentation in white lines is effected with silver foil or more commonly with an amalgam of mercury and tin let into the vessels before they are placed in the kiln. The effect is rather pretty.

The art pottery of Lucknow has been divided into four classes. The variety that has the largest sale consists of the unglazed but coloured articles of domestic use, like cups, goblets, plates, etc. The ware that is most seen on railway platforms and at shops are (1) varnished trays and vases, coloured in a brilliant style; (2)

models of fruits and vegetables; and (3) the well-known Lucknow figures. The sale of the models and the figures is gradually increasing with the result that there has been a very remarkable depreciation in the quality of the art. Good specimens are still available if a special order is given and an adequate price is offered.

The pottery of Khurja, Meerut, Rampur, Jaipur and Krishnagore is practically the same in style. The ordinary red colour of the pottery is covered with a white enamel and is then painted in dark blue and tarquoin.

CLASSIFICATION OF POTTERY

The term pottery is almost incapable of exact definition. It is generally understood to include all articles made of earthy materials, as in the use of the word earthenware but so broad a definition gives but little idea of the nature of the pottery. For simplicities' sake it is classified under two main headings, viz:—

(1) Porous pottery.

(a) Unglazed pottery.

(b) Bricks, tiles, terra-cotta, and refractory ware.

(2) Non-porous pottery:

(c) Earthenware.

(d) Porcelain, Sanitary ware, Electrical Porcelain.

Of these two varieties of pottery wares the non-porous type is by far the most important and its demand is increasing from day to day. As the number of pages at our disposal is limited we propose to deal in this article in detail with only the non-porous type for the present.

RAW MATERIALS

The raw materials employed in the manufacture of pottery wares are as follows:—

The clays used for pottery wares differ greatly in character, according to the purposes for which the ware is employed. For the coarsest ware a very low grade clay or brick earth may be used, but for the finer table ware the clays employed must be carefully selected, and must be free from all impurities which would materially affect their colour when burned.

(i) The pipe or ball clay forms the basis of the finer varieties of pottery. It absorbs much water and has great binding power, so that it can be easily shaped by the potter. On drying, however, it shrinks to a great extent; hence the other ingredients are necessary to incorporate in the mass in order to obtain good result.

The china clay or kaolin is mixed with pipe-clay to decrease its plasticity to a certin extent and also to counteract the yellow tinge of the pipe-clay produced on burning. It, however, requires very careful purification by washing and shifting before it may be suitable for the ceramic industry. The purified clay retains its white lustre on burning and is, therefore, immensely used.

(ii) Fluxes or Glass-forming Materials: These are used to make the ware strong when burned, as the fused matter on cooling produces a kind of cement. They also play an important part in the production of glazes, as the materials permit the glaze to flow uniformly over the entire ware at a lower temperature than that of the kiln. Of the various fluxes felspar is commonly used. This is a silicate of alumina and of alkali, chiefly potash and soda. The colour of felspar varies from green to yellow but the material usually preferred by potters is a pale yellowish brown. Its application to earthenware work is limited to a small extent.

(iii) Refractory Substance: These are heat-resisting substances used in the manufacture of pottery articles and are commonly known as flint. They are pure form of silica and are obtained in chalk formation.

(iv) Diluents: These are cheaper varieties of clays used occasionally as a substitute for a portion of pipe-clay to reduce the cost of production.

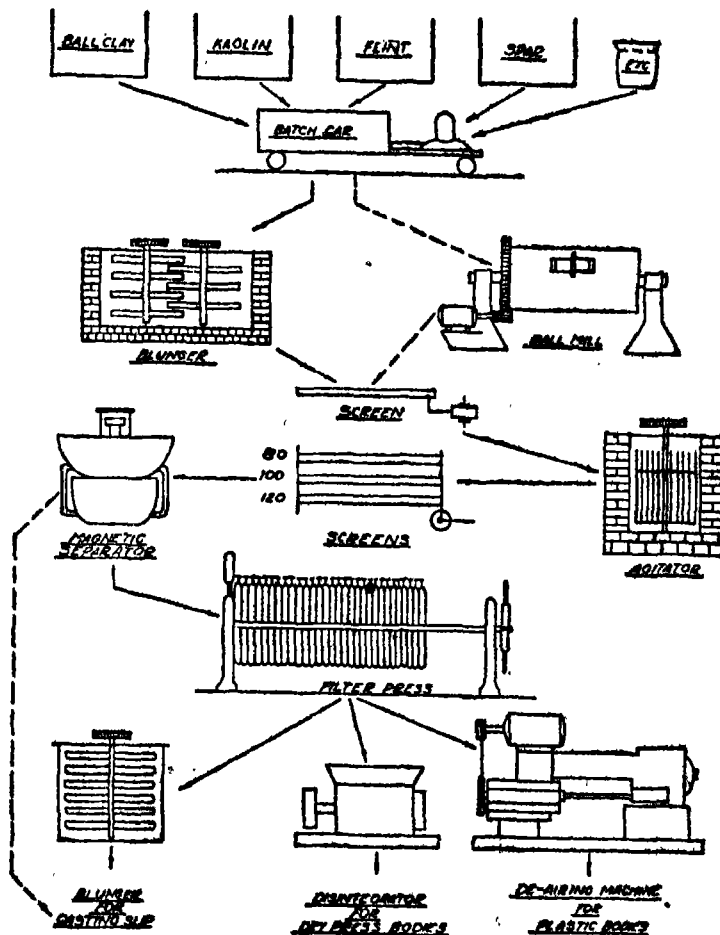
(v) Colouring Matters: These are usually metallic oxides to impart stains on the product when fused.

MACHINERIES

There are various types of machines used in different factories but the following are generally employed.

(1) Pug Mills: These mills vary in shape and capacity but are all provided with blades to cut up the clay, produce a thorough mixture, and pass it along to the discharge end. They do not take up as much room as the vertical blunger and are much more readily handled.

(2) Vertical Blunger: It consists of a circular tank provided with a vertical shaft carrying two wooden arms. The liquid is agitated by a rotary movement. From time to time a quantity of clay with a suitable proportion of water is introduced. The blunged clay may flow out continuously through the openings at the sides of the tank. This machine is preferable for stony clay.

(3) Filter Press: This is composed of a series of iron trays pressing one against the other by means of iron rods. Thick canvas with their ends folded to form bags are placed between the plates.

1. Flow Sheet of the body-preparation steps used in the Wet Process.

It is furnished with an iron pipe at its top to carry the liquid mass into the interior of each bag where it will be subjected to great pressure to squeeze out most of the water whilst still retaining the clay. When as much water as possible has been removed, the cloths are opened and the cakes of clay are taken out.

KNEADING MACHINE

A kneading machine consists of a pair of steel rollers rotated by a horizontal axis and three pairs of smaller rollers rotated by vertical axes over a platform on which the clay body is placed for kneading. The upper rollers press the body down which when passing between the vertical rollers is pressed upwards. This alternate up and down pressings remove the entrapped air from the mass and make it homogeneous, one operation taking about 45 minutes. This machine is specially suited for preparing porcelain bodies which are less plastic than earthenware or stoneware bodies.

POTTER'S WHEEL

Potter's wheel is chiefly employed in making various types of wares from plastic composition. There are two kinds of potter's wheel. Those which are driven by the thrower, and those which are mechanically driven. The simple potter's wheel of the first kind consists of a vertical spindle, the lower end of which rests on a wooden board provided with a pivot, the upper part being secured by a collar fastened to a table. This spindle is surmounted by a small disc called the wheel head, and at its lower end, it has a heavy solid flywheel which the workman sets in motion with one of his feet. The thrower sits on a small inclined board placed near the level of the table and can rest his feet, when the wheel has the desired speed, on another inclined board.

When large or very accurately shaped pieces have to be thrown a steady running of the wheel is necessary and for this purpose another kind of wheel, similar in principle to a hand spinning wheel, or Charka, can be used. This modification, however, requires an assistant, and a certain amount of skill is necessary to regulate properly the speed of the wheel to the requirements of the thrower.

For large outputs, especially when great accuracy is not required, hand driven wheels are replaced by power driven ones. When constant changing of speed of the wheel is required by the thrower, these wheels are not so convenient as the hand driven ones, although it is possible to vary the speed of these wheels either by alternating the diameter of the pulleys or by inserting intermediate conical drums.

MOULDS

These are perhaps the most costly part of the pottery equipments. There must be moulds of every size, and shape, from the elaborate vase to the simplest saucer. They are made in one or more parts, as may be necessary for the manuacture of the piece. Plates and flat working moulds are generally made in one piece, whereas sugar boxes, ewers, etc. are made in several parts.

Mould used in the pottery manufacture are generally made of pitcher or fired clay; and plaster of Paris. Moulds made from former give very clean, clear impression, and last considerably longer in good condition than those of plaster, but they have two defects. Firstly they cost considerably more in the first instance and secondly, they are only slightly absorbent; and for this reason a much larger quantity of pitcher moulds is required for those made of plaster. Pitcher is still, however considerably used for cup handles and such other small articles, and also for leaves, garlands and such other ornament-

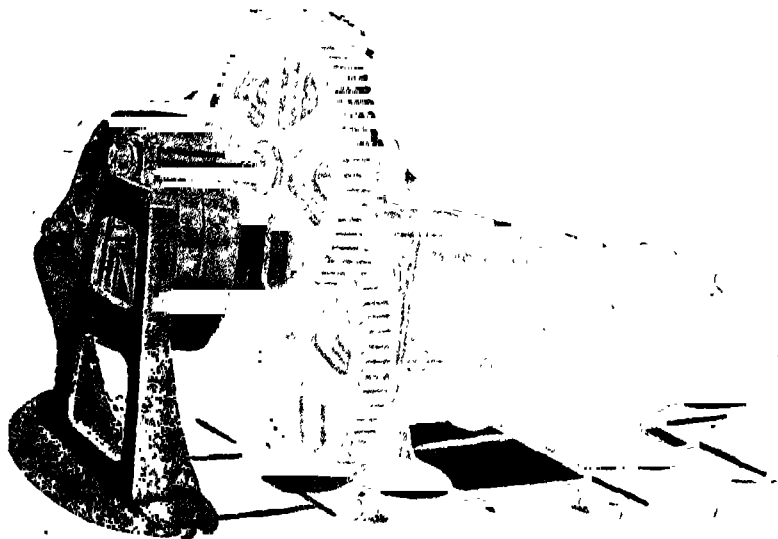
ations which are afterwards applied to vases made of Jasper and Basalt bodies.

Plaster is now the universal material for making potter's moulds, on account of its great absorptive power and the facility in working. The plaster used should be good, superfine plaster of Paris and it should always be stored in a dry place before use. Moulds would be much harder and their lives considerably increased if no plaster were used earlier than 10 or 15 days after boiling.

Moulds are made from a model representing exactly the article to be made, but slightly larger, to allow for the shrinkage in firing. Models are either made from wet clay or plaster. When models are made of round pieces such as cups, jugs, electrical insulators etc., it is better to have them made of plaster; but for making models of complicated shapes and with ornamental designs, clay is preferable.

The first mould obtained by casting from the model is seldom used for moulding. This mould is called the block mould or matter mould, and is only employed to make the casings as they are called by the mould makers, which are the reproductions of the models. From these casings working moulds are cast. Moulds should be thoroughly dried before being put to use and they last much longer if they are dried systematically between regular work. They should be dried at low heat and longer they dry at lower temperature, the better for the life of the moulds.

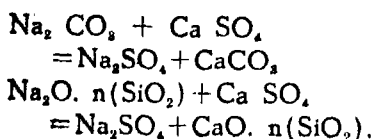
In making working moulds out of a casing, first clean all dust from its surface and if it is too dry, just dip it in a tub of water for a few seconds. Then size it thoroughly with an emulsion of soft soap solution with a wet sponge and keep the casing ready on the table. Mix three parts of plaster with one part of water by weight, and stir till it begins to set. It takes about five minutes for this operation. Pour the plaster slip into the casing with a circular movement and shake the liquid well to drive out all air bubbles arrested between the casing and the slip of plaster. Allow the plaster to harden. It warms up and when it is cold again, take off the mould from the casing. The mould is then scraped clean with an iron knife and marking or number written on it.

Moulds are made hard or soft according to the purpose for which they are made, by using more or less plaster with

2. Horizontal Pug-mill.

water. Casings are generally made hard. Moulds for casting are made softer than those for jolleying or pressing.

When plaster moulds are stored for a long time specially in a damp place, it is found that their surfaces are coated with a white fur-like substance which on examination is found to contain a considerable quantity of sodium sulphate, derived partly from the soluble salts in the clay, partly from the solubility of plaster in water, and in part from the decomposition of soda carbonate and silicate by the calcium sulphate.

$$Na_2CO_3 + CaSO_4 = Na_2SO_4 + CaCO_3$$

$$Na_2O.\ n(SiO_2) + CaSO_4 = Na_2SO_4 + CaO.\ n(SiO_2).$$

The presence of such matters as solu-phosphates increases the solvent action of water on plaster of Paris and this explains why the casting surface of bone china moulds do not last so long as those of earthenware. Growing crystals of sodium sulphate (Glauber salt) exert a great pressure on plaster moulds which are stored in a damp room and make them rotten. The effect of pressure of these crystals can be experimentally determined. If a solution of this salt is poured in a crazed earthenware vessel, the solution will gradually work its way into the porous body and in a couple of of weeks the whole vessel will be rotten and shatter to pieces by a slight shock. This explains why moulds stored in a damp place for long time are often found to become rotten, and break down during working.

KILNS

For burning pottery wares, round vertical kilns, or ovens, are chiefly employed. In shape they resemble a large, but stumpy, bottle, and consist of a cylinder of brickwork about 8 ft. 6 in. high above which is a high dome surmounted by a chimney. Around the circumference of the oven is a number of fireplaces, the flame and gases from which enter the oven and pass partly up small chambers and amongst the contents, and partly down through the floor. Both flame and gases eventually rise up through the kiln and finally pass out through the chimney at the top.

Down-draught ovens have long been used on account of the even temperature which can be produced in them. They are of various patterns and often differ considerably in their construction, but in all cases the flame and hot gases from the fuel first rise up inside the walls of the oven until they reach the dome, they are then turned downwards and, passing through one or more openings in the floor of the oven, they travel through a series of flues to a separate chimney.

TREATMENT OF RAW MATERIALS

The materials used for making pottery wares, except clays, are hard stony substances. These must be ground to fine powder before they can be incorporated into the clays to form the body. Hard minerals as quartz, felspar, marble, etc. are pulverised to fine powder in different stages. In the first stage the materials are crushed to small pieces in a powerful mill known as the jaw crusher. The crushed materials are then ground further in a pan roller mill to sufficient fineness that they pass through a sieve of 20 to 30 mesh. From the pan mills the material is charged into ball mills for the final grinding upto the desired fineness.

After the materials have been ground to their respective fineness they are kept in separate tanks in the liquid or slip condition, each slip being made to a definite consistency so that during subsequent mixing of different raw materials

their individual proportions may be calculated.

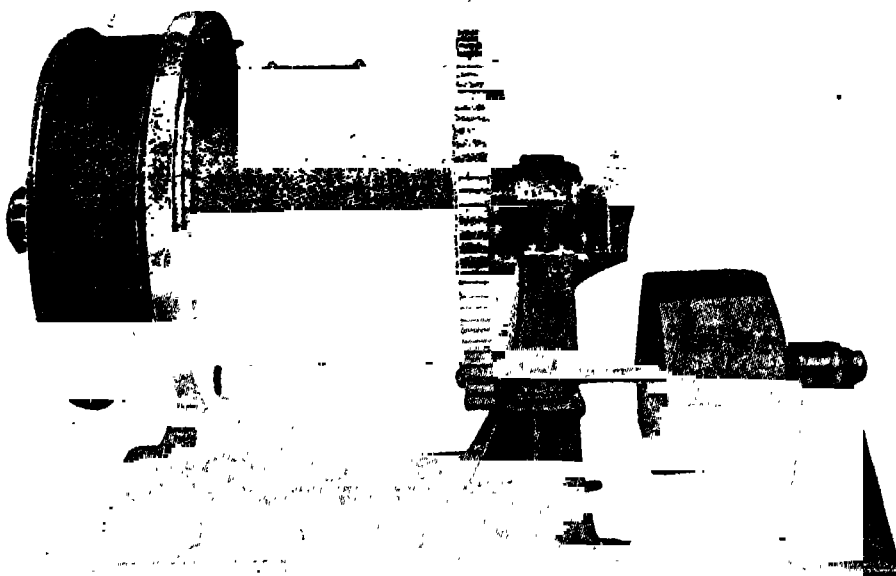
It has been found by practice that all the ground materials cannot be kept in the slip consistency as they either become too thick or settle down soon. For example the best consistency of ground flint or felspar as found by practice is about 32 ozs. to a pint and that of china clay and ball clay are 26 and 24 ozs. per pint respectively. The mixing of the different ground materials is done in a separate tank known as the mixing ark which is fitted with mechanically rotating paddles. This method is known as the wet method.

In the dry method, the raw materials from the pan roller mill are weighed in the dry powdery condition and charged into the ball mill for final grinding, the clay is added at the end so that the ball mill serves both as a grinder and a mixer, specially in small works, but in larger ones separate mixers are used for mixing clays with the other ground materials.

After proper mixing the slip is passed through an electromagnet in order to remove the iron particles that might have got mixed up during the previous operations. Any iron compounds obtained from the clay used is also removed by the electromagnet. These iron bearing particles if not removed at this stage would cause brown specking on the white ware. Now the slip is ready for de-watering. This is done in a filter press.

Filter presses are appliances for de-watering the clayey slip under pressure and making them stiffer for further use.

The de-watered cakes of clayey mass that come out of the filter press have the consistency of thick paste which are treated subsequently according to the method employed for shaping the wares.

For the plastic methods of shaping, the clay mass or body as it is called at this stake is sent to a kneading machine or a pug mill. The main functions of these machines are to press the body so as to squeeze out the air bubbles enclosed within the mass and to make the consistency of the body homogeneous specially with regard to the water content. The workability of the body is also greatly improved by this operation. A more de-

3. Ball Mill.

tailed treatment of mass composition is given under the body formation.

BODY FORMATION

The word "body" has obtained in ceramics an illogical signification, designating both the plastic mass and the substance which has become hard through firing.

Having pulverized the ingredients these are weighed out in proper proportions and put into the blunger for the purpose of mixing. This mixing operation is carried out in two ways known as the "wet" and "dry" methods. The dry method uses only enough water (4 to 10 per cent.) to aid in thorough mixing of the finely pulverised materials, while the wet process may use 50 per cent. or more of water, enough to form a fluid slip which holds the solid particles in suspension.

BLUNGING

At the blunger the clays and water are usually added first; the clays should be in lumps not larger than about 3 in. on a side. The non-plastics are added after the clays and other plastics have been thoroughly blunged and their lumps broken up. As the blunger does no grinding, the hard non-plastics must be properly ground in advance.

The time required for blunging depends upon the character of the clays and other ingredients; four to six hours is usually long enough to eliminate all lumps and bring the mixture to a smooth fluid slip. Slip should never be allowed to stand in the blunger if the blades are not in motion, as the non-plastics will quickly settle to the bottom, forming a hard deposit which is extremely difficult to remove.

Following complete blunging, the slip is passed through a screen to remove any unmixed lumps or foreign matter that might have got into it. The clays, particularly ball clays, usually contain considerable lignite and other contaminants which are removed by the screen. The slip is then pumped into large storage tanks, known as agitators, where it is held until needed.

The agitators are usually brick-lined, located under the slip house floor, and contain a wooden paddle of some type to keep the slip constantly agitated. The most popular type of agitator blade greatly resembles a section of picket fence, with 12 to 20 pickets, equally spaced on either side of the vertical drive shaft. The agitation of body slip removes considerable entrapped air which is beaten into the slip in the blunger.

BALL MILLING

In some plants where fine particle size and very intimate mixing of the body ingredients are of great importance, as in the manufacture of hotel china, it is normal practice to grind the materials together, either wet or dry, in a porcelain-lined ball mill. This milling operation may be used to replace blunging, although in some cases the milled material is also blunged for a short time. Large mills, up to 6 ft. diameter by 8 ft. length, are normally used, holding charges up to 6,000 lbs., which are ground to the proper size in about 24 hours. Milling is relatively an expensive operation, but it does permit grinding the various ingredients to uniform size, giving a very intimate mixture.

SCREENING

Mechanical cleaning is taken care of by a series of screens or lawns, mounted in wooden or metal frames.

Popular screening method employs a centrifuge, sometimes called a rotary trommel. In this equipment, the slip is poured through a funnel at the top, and travels down a vertical shaft to a rapidly revolving (1,800 r.p.m.) dish-shaped head which slings the slip outward around its

full diameter. The centrifugal force throws the slip against a cylindrical screen. That part of the slip which does not pass through the screen runs down the inside, washing the coarser particles down into a residue tank. from which the thinner fraction is pumped by a cone back up to the spray head for another pass at the screen.

MAGNETIC SEPARATION

Some type of magnetic separator is used in most whitewares plants to remove from the slip small magnetic particles of iron which might have been present in the raw materials or introduced during the earlier steps of the body preparation process.

When the ceramic slip has gone through the steps outlined above. it is a uniform mixture of the desired ingredients and is clean. It may, at this point, be pumped directly to the casting shop and used as casting slip. This is done in some plants where the amount of water used in blunging is the same as that desired in the final casting slip. In the average plant, however, the slip at this stage contains considerably more water than a casting slip should have. It must. therefore, be at least partially dewatered; this is usually accomplished by means of a filter press.

DEWATERING CLAY SLIPS

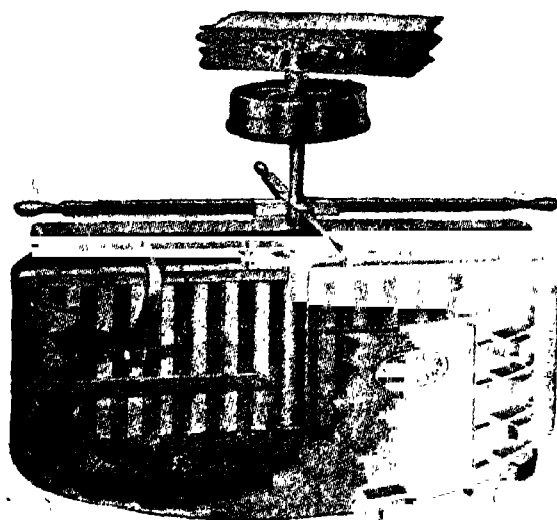
From the smooth agitator, which in reality is nothing more than a storage cistern, the slip is pumped to a filter press. The slip is forced through the central holes, under a pressure of 80-120 p.s.i., by a mechanical pump of compressed air. The pressure forces the water of the slip to pass through the filter cloths, while the solid particles are retained, forming a "cake" with a final water content of 18 to 25%.

The steps in the wet process which have been described so far are identical for each of the chief methods of ware forming—casting, jiggering and pressing. Following the filter pressing operation, however, all are different. If the ware is to be cast, the press cakes must be made into a slip with additional water. If it is to be jiggered, the clay cakes need only be processed through a de-airing machine, as they already have just about the proper water content. If it is to be pressed, they must be dried still more, and pulverized.

CASTING SLIP

Casting slip is prepared by blunging the filter press cakes with some additional water and electrolyte; the water content of the press cakes must first be determined. The extra water and electrolytes are put into a blunger; then the press cakes. broken into large chunks, are thrown in. Occasionally it becomes necessary to blend two or more slips of different densities; the necessary quantities of each can be computed by simple arithmetic after the dry weight per unit volume is determined for each slip.

PLASTIC FORMING

When the ware is to be formed by

4. Blunger.

jiggering plastic pressing, or turning, the filter press cakes must be prepared in a de-airing machine, which is often erroneously called a pug mill.

The purpose of the machine is solely to remove entrapped and absorbed air from the clay, though it does contain a set of pugging knives to break up the clay mass. One of the popular types also has a perforated plate to force the clay into a number of very small columns, so that entrapped air will have a shorter distance to travel. In the de-airing case, high vacuum, equivalent to 28 to 29 in. of mercury, enables the trapped air to break through the clay wall, after which it is taken out by the vacuum pump.

DRY PRESS BODIES

Filter press cakes have an average water content of about 20%; body mixtures for the dust press method of ware forming normally contain not over half that amount. The balance can quite readily be removed by merely storing the press cakes for a few days, letting simple evaporation do the job. This practice is followed in many plants. The press cakes then are granulated in some type of pulverizer, screened, and moisture added if necessary. A much more common method of preparing bodies for dry pressing is known as the "dry mixing" method which differs completely from the blunging-pressing-de-airing sequence just described.

DRY MIXING

The dry mixing method obviously is best suited to the preparation of bodies for ware formed on presses, such as steatite, tile, electrical porcelain, etc., as the desired amount of water can be directly controlled at the mixer. However, this method of mixing body materials is so much more efficient than the wet process that it has also been adopted in many art potteries, dinnerware plants, and in other processes where casting or jiggering are employed as the forming methods. In such cases the final product from the mixer must be either blunged to a slip or put through a pug mill for the addition of water to form plastic bodies.

METHOD OF SHAPING

In the production of pottery articles, a number of processes are used either alone or in combination according to the articles to be produced. The most important of these are—Throwing, Turning, Jolleying, Moulding, and Casting, each of which is briefly described below.

THROWING

Throwing is a special form of modelling and is based on the wheel universally known as potter's wheel on which to form the article. It is not an easy operation to describe but the following instructions will be found useful. The thrower takes a quantity of body, proportionate to the sizes of the object to be made, and places it on the wheelhead. He then sets the wheel in motion, and after having wetted his finger he presses the mass and forces it to rise and fall several times, then with the thumb on one part and the fingers on the other he makes it gradually assume the desired form. This operation requires much practice to press the mass uniformly, and to prevent knuckle marks. He must know how to regulate the speed of the wheel to the ascending or descending movement which he gives to the body with his hands, and must by suitable sprinklings prevent the body from drying unequally in contact with the fingers. The thrower places a model of the object to be made on the table in front of him. For the principal measurements he uses an instrument called a gauging rod, consisting of a vertical rod fixed on a stand and holding horizontal rods, which gives at the same time the height and the distance

m the side of the wheel head. When object is finished the thrower detaches by passing an iron wire between it and top of the wheel, and then places it on board to be taken to the drying room. en the object is too heavy to be thus noved without risk of throwing it out of ipe, this board is fixed on the wheel id previous to the throwing being comnced.

When the bodies are open, as porce-ı, the most complicated pieces must be de in several parts which are after-rds fastened together. The parts to joined are levelled in order to increase surface of the joint. Usually the ower makes several pieces of each kind, n, when the body is little stiffened, he ngs the parts together, after leaving the ıt with a sponge, and presses them nly into contact. In certain cases the cess called throwing by cord" may be d. Round a vertical rod a cord is led with varying thicknesses according the shape of the interior of the article. en the body is applied to the cord, the erior outline is given on the lathe, and er leaving the body to harden a little, cord is unwound and comes off entire-leaving a space corresponding to the ce it occupied. When it is desired to ain pieces having a more rigid form, a ofile is used. This profile is made by ans of mechanism gradually to proach the piece thrown on the lathe; it removes the superfluous body and produces an object having the exact form of the profile.

The throwing is generally completed by smoothing the surfaces with a small sponge, lightly applied, and by polishing them with a steel or horn blade.

Oval or square bodies can also be thrown, though this process is no longer used except for fancy articles, pieces being manufactured with much greater precision by means of moulds

TURNING

Turning is employed for giving a very exact form to objects made of a plastic body and also for making objects in a lean body which must be made thick because of its feeble cohesion.

Before it is fit for turning, the body must be sufficiently hard not to lose its form, but yet soft enough to allow the finger-nail to make an impression, the pieces waiting to be turned being kept in a cellar or other place having a constant humidity.

Both vertical lathes and horizontal lathes are used in turning, potter's or mechanical wheels being used for the former. A shank is made by throwing a mass of stiff clay on the wheel and by turning it to a shape capable of fixing the object to the wheel. This plasticity of the body is sufficient to hold the piece tightly to the shank after they have been lightly

5, Dehne's Filter Press.

pressed together. Short props serve as a support to the hand of the turner.

Horizontal lathes are similar to those used for turning wood. The tools used are small blades of steel, of various shapes fixed to a wooden handle. Compasses or calipers are used to measure the diameter or thickness of the object. Turning is an easier operation than throwing and can be quickly learnt by any thrower. The body must be cut, not scraped, and when it becomes too dry and apt to break it should be damped with a small sponge. The piece is finished by polishing it with a steel or horn blade.

When turning porcelain or other dry bodies, a dust is produced which is very disagreeable and injurious to the health of the workers. The latter should then be provided with marks.

JOLLEYING

In moulding on a jolley the part of the piece which must be poured with the greatest amount of care is made on a mould placed on a jolley, while the other is made with a profile.

Jolleys consist of a vertical shaft, similar to a potter's wheel, but the disc can be lighter and of less diameter. It is not necessary to modify the speed, and for articles of small dimensions (cups, flower-pots) it is sufficient to have a jolley of constant speed provided with a brake well within reach of the turner.

The heads of jolleys which receive the moulds must be placed and removed very rapidly. For this purpose they have at the top a truncated space corresponding to a similar projection on the mould. A simple pressure fixes and centres the latter. The head may be of plaster or wood. The edge of the truncated space is often strengthened by a lead ring.

Oval pieces can also be made on jolleys by using the arrangement in which the jolley spindle ends in a metallic piece carrying at its centre the head and at its two ends some T's, the horizontal branches of which slide along an eccentric disc, fixed by means of iron pins on the table of the jolley. This eccentric imparts to the head a reciprocating movement which in combination with the rotation of the jolley causes it to describe a kind of oval, the form of which is determined by the amount of eccentricity.

The moulds are made of plaster and in one piece for all flat objects (dishes, plates) as well as for those wide at the top (cups), but it is necessary to make them in two or three parts for articles with narrow apertures. In all cases they are terminated at the lower part by a truncated cone which fits into the head.

Profiles are rather thick sheets of steel or strongly fired body (faience or porcelain body) cut so as to remove the excess of material and to press the body against the mould.

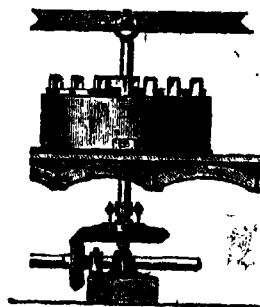
The profile is fixed to a support, called a jigger fastened on the table of the jolley and capable of turning round a horizontal axis, or the profile is fixed to an upright, which allows it to descend in contact with the body, then makes it turn by means of a handle fixed on the vertical beam.

In moulding bodies for common pottery-ware of suitable shape (porringers, flower-pots, etc.) in a single operation, the workman places in the mould a piece of body, sets the lathe in motion and gradually introduces the profile. This compresses the body towards the mould and finally leaves between it and the mould a layer of body which has exactly the section of the piece of pottery desired. For pieces requiring care (plates, dishes, etc.) and a compact body free from bubbles, it is preferable to make the "batts" on the jigger, the head being replaced by a disc

on which is placed a piece of body which is pressed into the form of "batt" by means of a profile mounted on one arm. When the body is very open (porcelain) it is preferable to use a wooden ring covered with a stretched skin, mounted on the head. The helicoid profile descends vertically and the "batt" obtained is removed with the ring.

Plates and similar articles are made outside the mould, the "batt" being placed on or in the mould, the jolley being set in motion and the body pressed close to the mould. The profile is then drawn down until the article is of the correct shape. The profile must be so placed that it leans to the centre of the piece so as to drive the excess of body towards the circumference. When the pieces of pottery have a convex shape this process is no longer applicable. The profile is fixed at the end of a prop slightly eccentric to the axis of the jigger. When the profile is in just position it can enter the piece of ware, it is then made to take the position turning a right angle which puts it into contact with the body. To allow of emptying the mould must be in two parts. Very often bodies (porcelain) do not readily assume the form of the mould. The use of the profile also demands a certain plasticity of body unless the piece is given a thickness considerably greater than is necessary in the finished ware, and when dry is taken out and turned. The turning then constitutes the chief operation in the making, and must not be confused with the operation of finishing, which is dealt with later.

CASTING

If a dry plaster mould is filled with a liquid body (slip) and the liquid is removed at the end of some minutes, the inside of the mould will be covered with a layer of the body, a part of the water having been absorbed by the plaster. By leaving this body in the mould until it has become hard it can be delivered, and an article obtained reproducing exactly the form of the mould, and of any desired thickness. The body should not be very plastic, or the absorbing action of the plaster would be hindered, as, with a plastic body, the layer nearest the mould forms an impermeable coating. Hence this process of making can only be employed for certain porcelain bodies or for others having china clay or other lean clays as a base. The body should be extremely fine and very carefully prepared. It is expedient to pass

6. Wet Grinding Mill.

it through a very fine sieve before use so as to separate all air-bubbles. The moulds are similar to those used for moulding by hand, and according to the form of the object to be reproduced, are in one or more pieces, and are placed so that the opening through which the body slip will be poured is at the top. The excess of body slip may be removed either through the same orifice, or (which is better for strong bodies) through a lower one, which is closed by a plug during the fill. The length of time the mould remains filled with slip depends on the plasticity of the body, and on the absorbing power of the plaster, i.e. on the thickness of the walls of the mould (two to four inches) and on its dryness. It is usually necessary to dry the mould after each filling. With thick-walled articles the "pouring" should be done in three or four times, allowing the

the body to harden a little between each operation. When the moulds have complicated designs or are difficult to work, it is well to paint them with the body slip by means of a brush before casting to prevent the air-bubbles adhering to the plaster. If the plaster absorbs too rapidly, which would cause breaking in the pieces, the inside of the mould should be painted with a very thin layer of an emulsion of hard soap in olive oil.

The absorption of the plaster can be hastened by placing the mould in a hermetically sealed box, in which a vacuum is made by means of an air-pump or by closing the interior of the mould, and connecting it with a reservoir of air under pressure.

FINISHING

Finishing consists of a series of manual operations, which vary according to the form of the object made, but always have two aims:—

(1) To correct the imperfections of making. (2) To unite the different portions of an article when these have been made separately.

The imperfections of making occur chiefly at the seams of the moulds, and in certain parts which had to be left solid, but which it is necessary to scoop out. The finishing is generally done by means of hand tools. When the articles have been thrown, the finishing is generally done on the lathe, the body being first allowed to harden and then turned.

When a large number of pieces is made simultaneously, certain precautions must be taken so that their drying takes place conveniently. When necessary, the latter is arrested by keeping the objects in a damp place.

The manual operations of finishing may be thus distinguished:—

Scraping, carving, grooving and perforating, repairing, re-uniting the thick parts and slipping.

Of these slipping is by far the most important operation. This is employed for bodies which are but slightly plastic, and for fine objects, handles, spouts, feet or stands, ornaments, etc., which have been made by themselves and which would lose their shape by sticking.

Slipping consists in covering a body with a layer of another body known by the name of a slip in order to (1) modify the colouring and the appearance of the first body; (2) give to the article the properties suitable for enabling to be covered with a given glaze; (3) obtain decorative effects by the use of bodies or engobes of various colours. The means employed for this purpose will be mentioned under the decoration of pottery ware.

Considered merely in the light of fulfilling the first two aims, slipping or engobing is a very simple operation. The only difficulty consists in finding a slip which fulfils the required conditions and having the same shrinkage in drying and in firing as the body on which it is placed. The correct composition can only be ascertained by trial, a likely body being used as the foundation, and with this is mixed a plastic material, such as white clay, or a non-plastic material, such as fine sand, until the trial pieces obtained are without defects. If the body has more shrinkage than the slip the latter cracks, leaving in its place the bare body. If the contrary defect is produced the slip becomes detached and breaks of in scales.

When a slip of the desired composition is obtained it is blunged to form a liquid body.

The body made must, on its part, be hard enough to be manipulated without danger of its losing its shape, but it must

not be too dry to absorb the water of the slip, which would consequently become dry and yet would not adhere.

The application of the slip or engobe may be made—

(1) By dipping the object in a vessel containing the liquid slip, either by immersing it entirely or by only dipping those parts which it is desired to cover.

(2) By sprinkling the object with the slip, the excess of which falls into a vessel placed below, a process employed when it is only desired to cover the exterior.

(3) By filling the object with the liquid, and by emptying it shortly afterwards: a method utilized for covering the inside of vessels.

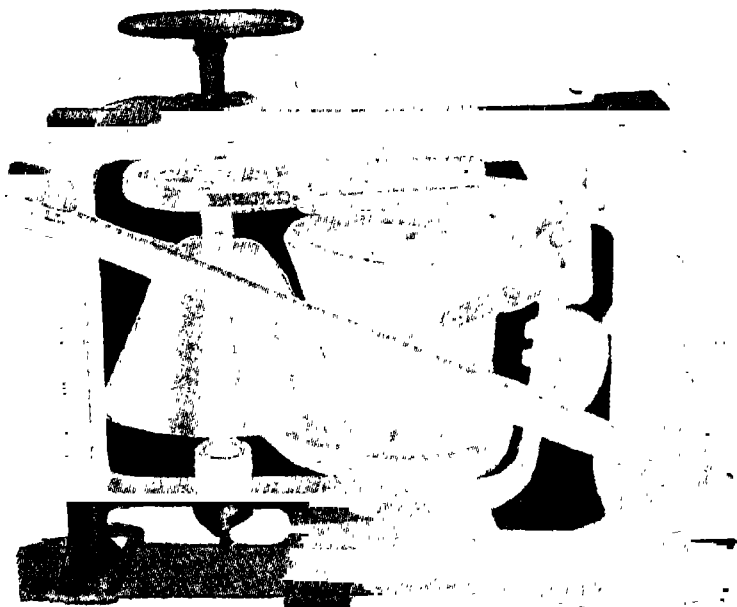
(4) By applying the slip with a brush.

It sometimes happens that the slip is more refractory than the body, and adheres badly after firing. This fault can be remedied by the addition of a certain proportion (from 1 to 10 per cent.) of alkalies, which considerably increases the fusibility and adhesion.

In certain cases it is necessary to give to the slip a greater thickness than that which it is possible to obtain by the means just indicated, as in the case of paving tiles which are liable to wear thin, and would leave the body with its natural colouring, or when the pieces of pottery have projecting parts, for which it is desired to preserve a precise form.

DRYING

By the term "drying" is understood the operation by which the water of formation is removed from bodies so as to harden them sufficiently to enable them to be carried to the oven and placed therein, and to make the firing more rapid and less risky. When the articles are made of dry body, the drying may sometimes be avoided and the ware placed in the oven immediately the bodies are made.

In the drying of any "body", the surfaces first lose a certain proportion of water. A further supply of water is then carried to the surface by the interior layers which are nearest to them, this transference being continued till the centre of the

7. Cone-driven Potter's Wheel.

mass is reached. There is thus produced a capillary flow of water from the centre towards the surfaces,* the speed of which depends on the texture of the body. It continues at the same speed so long as the drying action is not transmitted to the centre of the ware, but then the speed diminishes, but does not cease for some time, viz. until the body is uniformly dry.

The elimination of the water takes place (theoretically) in two periods: in the first its speed is constant and proportionate to the duration of the drying; in the second it diminishes progressively until it ceases entirely. So long as there remains in the body a sufficient quantity of water to allow the grains to become displaced, the latter collect together, filling up the spaces occasioned by the departure of the water which separated them. The result is reduction in volume equal to the volume of water removed. When there is no longer sufficient water to allow the grains to move, a further elimination of the water produces, in the interior of the body, spaces equal to the volume of water which has been removed.

This second phase of the drying continues until the whole of formation has been eliminated. If the drying has taken place equally throughout the whole mass, these two phases would be clearly distinct, but this condition being impossible to fulfil, the edges and the surfaces being necessarily dry before the centre, the drying is in reality subdivided into three phases :—

(1) In which the body shrinks in volume proportionally to the water eliminated. (2) In which spaces begin to form at the same time that the body continues to contract. (3) In which the shrinkage ceases, the spaces which are produced being proportional to the water eliminated. water is not attended by any further

In the third phase of drying the loss of water is not attended by any further shrinkage excepting that which may be due to the contraction of the colloidal matter in the clay. Hence the increase of porosity developed at this stage is very nearly equal to the loss of water.

To prevent cracking or distortion of shape during drying of claywares the two factors to be considered are, to increase the diffusion of moisture from within to the surface of the ware and, to control the evaporation from the surface. In many clays specially rich in colloidal matter, addition of acids or salts have been found to be beneficial. It also improves the firing property of the clay by increasing the vitrification period, that is to say, the clay will start to vitrify at a lower temperature and will not get overfired at the temperature when untreated clay is liable to get distorted.

Temperature and speed of air also play important parts in the progress of drying. The viscocity of water at 50°C is only half its value at 20°C. Hence the speed of drying at the higher temperature will be nearly double. At 100°C the drying power of the hot air is more than 20 times what it is at 20°C.

The rapidity with which drying can take place depends mainly on the texture of the body and the shape and thickness of the articles. As the speed of drying is greatest at the first stage, it is sometimes found advantageous, to cover the articles at this stage, with a damp cloth, or to invert the moulds containing the articles so as to prevent too rapid drying, which may lead to distortion of shape of rupture. When the drying is rapid, the shrinkage is less, than when the drying is slow. Thus, of two articles made of the same body, the one would shrink about 6 per cent. when dried in 24 hours, while the other shrinks 7 per cent. if dried in 120 hours.

When an article consists of both thick and thin parts, the thin parts such as the corners and edges, dry more rapidly than the thick parts and offer resistance to the latter. If the tension is too great for the mass to resist, ruptures or cracks will arise. It is therefore advisable to avoid any abrupt passage from a thick to a thin shape in the same article.

In hot countries like India artificial drier can be dispensed with for normal manufacture, except during the few months of rains, when the waste heat from the ovens can be conveniently employed.

SCUMMING

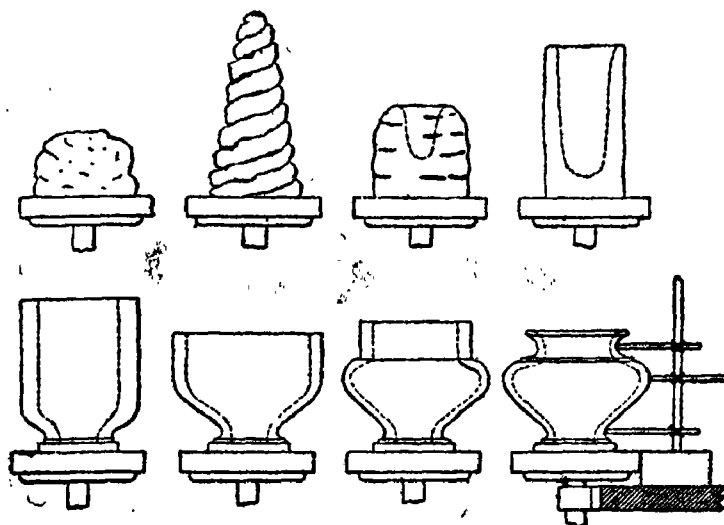
When the wares dry slowly, the soluble salts contained in the body come out on the surface and as the water dries up, the salts get deposited on the wares. These deposits are generally removed during the finishing process and just before actual firing of the wares.

FIRING THE WARES

Firing is undoubtedly the most important single part of the ceramic manufacturing process. The firing not only develops the full 50 pyrochemical reactions within the ware but also controls at stages for wares of different kinds. The burning of terra-cotta wares is stopped just at the moment the clay has hardened sufficiently, while fine earthenwares are fired up to the stage of incipient fusion of particles. Soft porcelain and stonewares are vitrified more or less completely so that the latter show some translucency when seen through transmitted light.

In order to understand the reactions which go on inside a clay body while it is being fired, the whole period of firing may be divided into different stages. In the book entitled "Modern Pottery Manufacture" the author Mr. H. N. Bose has dealt with it as follows:—

1. SMOKING STAGE UP TO 150°C

Strictly speaking this stage should be included in drying. During this period any water of formation which has not been previously driven out in the drier together with hygroscopic moisture, are got rid of. The object of the fire man is to remove this water as rapidly and as completely as possible, without damaging the goods; sufficient time being allowed to effect the evaporation of the water without causing it to boil and so spoil the surface

8. Stages in Process of Throwing a Vase.

of the wares. If the heating is imperfectly carried out, the goods are apt to fly, or unpleasant condensation products are formed on them. The water vapour, if not driven out of the oven as quickly as they are formed, would condense on the saggars or the wares inside them, as a fairly strong acid, chiefly owing to the sulphurous gases produced by the oxidation of sulphur present in the coal. As the air passing through the kiln during this smoking period is the chief agent which carries away the steam and other volatile matters, it is necessary to allow sufficient passage of the same during this period. The name smoking or steaming is derived from the facts that during this period the firing is never bright and the oven is full of steam derived from the damp goods. The period of smoking varies greatly according to the nature of the goods. Dust pressed tiles which are not dried before firing generally take 40-50 hours, whereas porcelain goods with open bodies require only 5 to 6 hours for this purpose.

2. DECOMPOSITION STAGE 200-500°C

As the temperature rises above 200°C the volatile organic matters begin to decompose, and any hydrated oxide of iron present in the clay, begins to dehydrate and the sulphides decompose. The rate of firing of the oven at this stage, may be sufficiently increased provided the clay does not contain much hydrated from oxides or organic compounds. When the temperature inside the oven is about 500°C or the oven just begins to become red, the firing should be again slowed down.

3. DEHYDRATION STAGE 450-600°C

At this stage the chemically combined water of the clay substance, begins to decompose very rapidly and if the firing is not slow, the wares may get damaged. At this stage, the clay is very liable to absorb gases and susceptible to the actions of acids. The amount of water vapour given out from the wares in an earthenware biscuit oven at this stage, has been estimated to be about 50 times the volume of the oven and this vapour must be cleared off with plenty supply of air, otherwise the oxidation of the carbonaceous matters present in the clay will suffer greatly, as carbon can not be fully burnt off except by direct contact of air with its particles.

4. OXIDATION STAGE 350-900°C

This period actually begins with the oxidation of the easily ignited organic matters or sulphur compounds which begins near about 350°C and continues until the last trace of carbon is burnt out at the high temperature of over 900°C. It therefore overlaps the dehydration period and in some cases infringes also on the next stage.

Iron sulphide FeS_2 when present in clays begins to decompose to FeS at about 400°C but it requires a much higher temperature of about 800°C to convert FeS into oxide of iron. The sulphur gases produced from the claywares at this high temperature can not do much damage if a good draft is created to remove the gases quickly.

The decomposition products of the clay substance at this stage may be roughly said to be free silica, free alumina and oxides of lime, magnesia, iron and alkalies. If a sample of china clay body is withdrawn from the oven at about 800°C, it would be found, to possess a pink colour due to the separation of free iron oxides from the clay body. As the temperature, rises, the iron unites with the alumina and silica, forming a colourless body; but if carbon be present in the clay, the iron cannot unite with the alumina, until the whole of carbon is got rid of.

Near the end of this period the body becomes porous due to the expulsion of the organic matter and the decomposition of

the carbonates and sulphides. The external volume also increases slightly due partly to the increase in volume of the quartz and partly to the specific volume increase of the clay substance. Brown and Montgomery have shown that when a kaolin is heated to 600°C it loses about 13 per cent in weight and its specific gravity drops down to 2.5. At 800°C the corresponding loss is 14 per cent but the specific gravity remains the same at 2.5. Wares at this stage is known as Biscuit fired and porcelain wares are often removed at this stage for glazing.

5. VITRIFICATION STAGE 900-1300°C

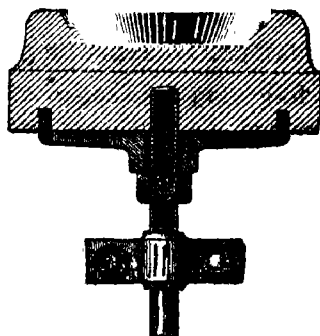
As the heating progresses further some of the materials present in the body combine together and form easily fusible masses known as eutectic compounds.

These easily fusible substances melt and flow among the pores of the particles and gradually fill some of them with a cementing glass. If the ware is removed at this stage it will be found to possess good hardness, ring and low porosity. This is the stage of incipient vitrification and most of the pottery wares are removed from firing at this stage; but the temperature required to attain this stage is quite different for different classes of articles. Fine earthenwares are finished at about 1200°C or more. On further heating, the glassy material attacks and dissolves more unmolten materials so that the wares gradually lose their porosity and become what are known as vitrified wares.

When the firing is harder the proportion of molten material would be so large that the unmolten components could not resist its softening action and the ware would lose its shape. In this case felspar glass is a better flux than lime or magnesia ones because the former has a high viscosity and does not allow the ware to lose its shape due to slight overfiring.

6. CRYSTALLISATION STAGE 1300°C UPWARDS

When the temperature rises above 1300°C a new compound is formed which is known as Mullite—$3Al_2O_3 2SiO_2$ and has a crystalline structure similar to sillimanite.

The duration of heating at the finishing point has a great effect on the goods fired. This prolonged heating at a constant temperature is known as soaking and it is very essential in order that the contents of the kiln may be heated uniformly on all sides as heat penetrates through heavy claywares but very slowly. Moreover the temperature in some commercial kilns vary from 50° to 100°C in different parts, and it is essential to bring up the temperature in different parts to the same level by proper soaking of the kiln. Slow heating also helps in the formation of crystals which is so essential in hard porcelain.

9. Jolley Head.

GLAZES AND GLAZING

In discussing the various pottery bodies, it will be seen that some of them contain a sufficient proportion of fusible material to approach vitrification at the temperature used for manufacture. Such bodies become sufficiently impervious to fluids to serve many useful purposes, but in the majority of cases, the body remains porous after firing and, for use or beauty,

must be coated with a definite vitreous envelope known as the glaze.

All glazes are found to contain silica. alumina and one or more of the alkaline or alkaline-earth bases as necessary ingredients. Chemically a glaze is a rapidly solidified solution in which silica, silicates, borates, etc. may either be solvents or solutes. For colouring purposes metallic oxides, phosphates, etc. may be dissolved or suspended in them. It is natural to think that the glaze is a distinct layer of glassy material melted over the surface of the pottery but in no case is this simple view sufficient. In every case the glaze and body react with each other on fusion, and there is always an intermediate layer of glaze-body or body-glaze, while in such instances as salt-glaze, or the common lead glazes obtained by melting lead oxide on the ware itself, the greater part of the silica and alumina needed to form the glaze are obtained from the surface of the ware by the action of soda or lead oxide at a high temperature.

TYPICAL COMPOSITION OF GLAZES

The following are some of the important glaze compositions suitable for glazing different types of wares as given in Martin's Industrial Chemistry.

EARTHENWARE GLAZE

Mixture of Frits for earthenware glaze:—

Borax	30	36	24	parts.
Cornish or china stone	30	20	21	,,
China clay	5	6	10	,,
Flint ..	15	20	20	,,
Whiting	20	18	14	,,
Soda carbonate	—	—	11	,,

MIXTURES FOR EARTHENWARE GLAZE

Frit	50	58	36	parts.
China stone	25	16	40	,,
White lead	25	22	24	,,
Flint	—	4	—	,,

HARD PORCELAIN GLAZE

Ground hard porcelain (grog.)	25	parts.
Quartz	42	,,
Chalk	33	,,

GLASSY PORCELAINS

Litharge	38	parts.
Sand	27	,,
Flint	11	,,
Potash	15	,,
Soda	9	,,

FRIT FOR BONE CHINA

China clay	12	parts.
Quartz or flint	15	,,
Cornish stone	20	,,
Chalk or whiting	18	,,
Borax	35	,,

GLAZE FOR BONE CHINA

Frit	65	parts.
Cornish stone	11	,,
Flint	11	,,
White lead	13	,,

GLAZE FOR ELECTRICAL PORCELAIN

Felspar	42	parts.
Quartz	41	,,
Dolomite	10	,,
Kaolin	7	,,

GLAZE FOR CHEMICAL PORCELAIN

Felspar	37	parts.
Quartz	25	,,
Barium carbonate	15	,,
Whiting	10	,,
Kaolin	8	,,
Zinc oxide	5	,,

PREPARATION OF THE MATERIALS

This is done in its most complex form by the following operations:—

(1) Preparation of the raw materials; (2) Mixing; (3) Fritting; (4) Mixing and grinding in water.

The raw materials ought to be in the form of very fine powders, as pure as

possible, and of a composition that does not change in the air.

Grinding is done in the manner as described under the treatment of raw materials. The ground materials are then weighed and mixed thoroughly when the materials have been ground in water, those which are liable to dissolve in the water must first be made insoluble.. The chief of these are the alkaline salts, boracic acid and borax. To do this, they are fritted with silica, lime, oxide of lead etc., according to the composition of the glaze. In making this mixture an attempt should be made to obtain products as fusible as possible, so as to economize the expenses of fritting.

When a material is to be introduced into the composition of a glaze in a very small proportion, making it very difficult to mix uniformly with the others, it should be added to the frit.

Fritting consists in uniting the materials under the influence of heat, by melting them so as to form a glass. For small quantities this is done in fireclay crucibles heated in special furnaces. When a sufficient heat has been attained, their contents are poured into water to shatter the vitreous mass, and to make it more easy to grind; the crucible is then refilled. Such crucibles should not contain more than 22 lb. of materials if they are to be easily handled. They only bear a small number of heatings, and the furnace should be arranged so as to enable any glaze which run out, in the event of their breaking to be gathered up.

In some potteries the fritting is carried out in saggers placed in the kilns for burning the ware, the pieces of vitreous glaze being taken out while emptying the oven. To prevent it sticking to the bottom of the saggers it is necessary to cover the latter with flint, which adheres strongly, so that this method must be regarded simply as a makeshift and not as a regular method of manufacturing frits. In order to carry out the fritting effectively it is essential for the raw materials to be well mixed, but it is not necessary to powder them very finely. The alkaline salts, boracic acid and borax, may be in rather large pieces, and silica and felspar may be in the form of coarse powder.

The heating in all cases ought to be even, and it is especially essential in lead glazes that the atmosphere of the furnace be never reducing or smoky or the oxide of lead will be reduced to metallic lead. The crucibles and the hearth of the furnace should be made of aluminous fireclay and should not contain obvious grains of free silica, which might be attacked and dissolved by the glaze.

10. Vertical Jigger & Jolley.

Certain glazes may be mixed when dry, using substances which are first finely powdered, but this is unusual, and it is preferable to mix the materials composing the glaze at the same time as the last grinding in water, as this makes the mixture very homogeneous.

The ground glazes are generally sifted to keep out the coarser grains or lumps. When the sieves are fine the glaze must be very liquid to pass through them, and it is best to let it settle in basins for it to become of a suiable consistency.

The liquid glaze should always be freed from particles of iron by being treated in a vat containing electric magnets, some fixed, others movable, which act as agitators. The purified glaze is emptied through a cock, while the magnets, which can easily be taken out, are from time to time removed, cleaned, and then replaced.

The application of glazes may be carried out on dry ware or on biscuit. In the first case, the ware must be dry and sufficiently resisting not to be spoilt either by the actual application, or by the dampness of the glaze. In the second case, the articles to be glazed may have undergone a definite burning at a high temperature, or they may have been warmed to make the application easier. Whatever the method employed, it is essential that the body should be sufficiently porous and absorbent for it to absorb the glaze and make it adhere.

Six methods of applying glazes are used; dipping or immersing, pouring, sifting or sprinkling, spraying, dusting, and volatilization.

In applying by dipping or immersion the articles are dipped in a basin containing the liquid glaze; the article, in consequence of its porosity, absorbs a certain quantity of water and there is deposited on its surface a layer of glaze. For success it is necessary that there be a resistant body, sufficiently empty of water, and a glaze which has a consistency corresponding to the absorption of the body and to the thickness of the layer of glaze desired. The suitable consistency, which generally is about that of cream, can only be ascertained by trial. Care must be taken that, when the glaze has dried on the article, it is not to be powdery and liable to drop off at the least touch. Glazes containing slightly plastic materials, as clay, lime, white lead, etc., have not this fault if they have not been first fritted. For this reason the fritting ought never to be carried out with the entire components of the glaze, and it is best to keep the more plastic materials to add to the others when they are being ground in water.

Glazes which are not sufficiently pliant, settle unequally and too rapidly: they may then be mixed with vinegar, milk, starch, and gums, but these additions often cause other troubles, and it is better to try to find a glaze composition which does not have this fault.

Before dipping articles, any dust on them must first be carefully removed, they are then held by the fingers by the parts that do not need to be covered with glaze. If there are no such parts, it is better to take them up with pincers having pointed claws, so as only to leave small places on which the glaze is deffective. These places can be touched afterwards with a brush filled with glaze.

For pieces that need care, retouching is inevitable. The parts on which there is too much glaze (as drops or streaks) are equalized either with the finger or a scraper; some glaze is added to the edges (which generally get too little) with a brush; some parts, as the feet, plinths, etc., on which the piece ought to stand, are cleaned.

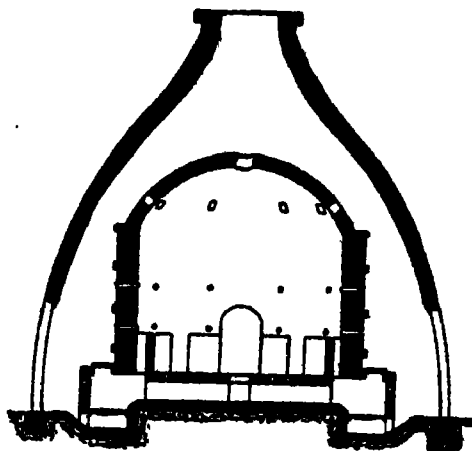
In pouring, the glaze is poured over the article which is given a suitable motion to spread the glaze uniformly. The unused glaze falls into a receptacle over which the article is held. This method is employed when the glaze is to be put only on the inside or outside of a vessel. It is also used for those bodies which are not very porous and which, by dipping, would not retain a sufficiently thick layer. In this case the glaze ought to be made thicker, and, if necessary, its viscidity should be increased with milk, starch, or gums; these materials afterwards disappear (in burning). Any retouching is done in the same way as in the preceding case.

Sprinkling, which is scarcely ever used now, consist in sprinkling the objects with liquid glaze. It is done with brushes that have short, hard hairs, which are dipped in the glaze, shaken to get rid of the surplus liquid, and afterwards the ware is sprinkled from them. This method was employed for bodies which, whilst unbaked, were friable or covered with reliefs, which could not, without being spoilt, have been dipped or poured.

At the present time for this kind of work, spraying or diffusion with a small apparatus known as a sprayer is preferred.

This consists of two tubes at right angles, one of which is in contact with a reservoir of glaze, and the other with some kind of air blast. The openings of the two pipes are arranged in such a manner that the current of air from one makes a draught and draws up the liquid in the other. For small objects, the blast may consist simply of an India rubber ball; for very large surfaces, an air pump that can give a pressure of about 8 inches of mercury must be used.

The sprayer is placed 12 inches to 18 inches from the object, according to its size and the force of the jet. The sprayer or the object is moved, or both simultaneously, so as to spread the glaze uniformly over all the surface. The whole thickness of the layer should not be put on at one time, but in two or more operations, allowing each layer to dry before putting on another. This prevents trickling and gives a more even thickness.

In all the foregoing methods the glaze is used as a liquid paste or slip; for the application by dusting, on the contrary, it is a dry powder. The articles ought to be of unbaked body that is still damp, so as to retain the glaze which is applied to them by means of a sieve. This method, which is now scarcely used except for coarse ware with a plumbiferous glaze, is very dangerous to the health of the workman because of the dust it makes.

11. Hovel Oven.

Volatilization consists in volatilizing the glaze by heat inside the kilns used for burning the paste and thus insuring its deposit on the surface of the ware, where it vitrifies by combining with the silica of the paste. This method is only used in the manufacture of stone ware.

GLAZE FIRING

In some works the body fire and glaze fire are performed in the same kiln, even

for two-fire ware. This, however, is an inefficient method, inasmuch as considerable quantities of ware in some intermediate stage of production are always cluttering the shop. Also, the kiln temperature must be juggled back and forth from bisque to glost temperatures. The use of separate kilns for body and glaze firing is preferred, even though these kilns are of necessity smaller than one "universal" kiln. For the firing of overglaze colours, which may mature at temperatures as low as 1,600°F., a decorating kiln may be utilized. This is usually a continuous kiln but, because of the temperature, need not be built with refractory brick or baffles; nickel alloys may be used for all working parts in the high heat zone.

The firing of glazes is somewhat more exacting than that of bodies, because some of the glaze colorants are quite sensitive to small temperature variations, and many glazes are useful only with certain types of kiln atmosphere. A reducing atmosphere is generally considered deleterious to glost firing, yet some glazes require a reducing atmosphere to achieve proper colour development.

Certain kiln gases have very undesirable effects on glazes, as has been summarized by Koeing. Sulphur may get on to the glaze from: (1) the fuel, (2) glaze ingredients, (3) body ingredients, (4) water used in body or glaze, (5) soluble sulphates used to thicken glaze, or (6) plaster of Paris moulds. This will cause a number of defects, including scumming devitrification, loss of gloss, and blistering. In order to prevent such defects, the sulphur concentration in the kiln should be less than 5 grains per 100 cu. ft. of combustion gases.

Unburned hydrocarbons may deposit finely divided carbon on the ware, forming highly reducing zones adjacent to the ware. This principle is sometimes used deliberately, thin coatings of carbon, silicon carbide or other material being applied to certain parts of a piece of ware, to give reducing conditions only at such areas. In this way both blue and red colours may be obtained from copper-containing glazes on one piece of ware.

EARTHENWARE

Earthenware comprises a large number of different kinds of pottery, all of which consist of a porous body covered with a suitable glaze. It consists of a mixture of pipe or ball-clay, china clay, flint and felspar in different proportions. The glaze is also composed of similar materials together with various lead and boron compounds in multiple proportions so as to increase the intrinsic beauty.

The proportions of the different materials used differ considerably in different factories and according to the kind of ware to be produced. The following table shows how the relative proportions of the ingredients of an earthenware body may be varied:—

Pipe Clay ...	50	47	43	25	31	18	per cent.
China Clay...	10	24	24	25	36	43	,, ,,
Felspar ...	5	7	10	10	12	15	,, ,,
Flint ..	35	22	23	40	21	24	,, ,,

PREPARATION OF EARTHENWARE BODIES

The various ingredients that go to form the body of the earthenware must be reduced to a state of fine division, and thoroughly and uniformly mixed. In cases of cheap articles the preparation of the bodies is comparatively simple, it being sufficient to crush or remove the solid foreign particles and then pass the wet clay through a pug-mill to secure the necessary uniformity. The greatest care in the preparation of uniformly plastic bodies is naturally required where several ingredients have to be ground and mixed. In fine earthenware, for instance, the pipe-clay, china clay, felspar and flint having

all been reduced to the state of fine powder are suspended in water, and the requisite quantities of the "slips" are run into a large vertical tank termed a blunger and thoroughly agitated. The "slip" thus obtained is passed through fine sieves to remove coarse particles and run over electro-magnets in order to remove iron and magnetisable particles present. It then makes its way into the filter press, where most of the water is removed by filtration through canvas. Now, the plastic body thus obtained being harder on the outside than on the inside, it is thoroughly beaten up or put through a pug mill to render it uniform and free from air bubbles. Instead of adopting the above procedure the raw materials are sometimes ground and dried; the requisite quantities are then weighed out and mixed with water.

METHODS OF SHAPING

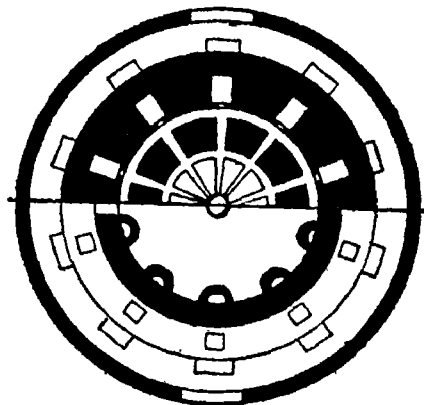
In the production of earthenware, a number of processes may be used either alone or in combination according to the articles to be produced. The most important of these are—Throwing, Turning, Jolleying, Moulding and Casting, which are already described under the general processes.

COLOUR OF EARTHENWARE

As almost all varieties of plastic clay contain sufficient traces of iron compounds to produce at least a pale cream or ivory-coloured body when fired, it is customary, in the manufacture of very white earthenware, to add a small quantity of cobalt oxide, which by the production of a blue silicate of cobalt neutralises the effect of the yellow tone due to the iron compounds 1 part of cobalt oxide is sufficient to whiten about 2000 parts of cream-coloured body. Excess of flint or china clay and addition of lime or magnesia to the clay also whiten the fired body to a marked degree. The colour of a fired body is also influenced by the nature of the kiln atmosphere during the last stages of the firing. The whiteness of hard porcelain is due to the reducing atmosphere. For specially coloured bodies details have been given at the proper place in this articles.

FIRING

The firing of earthenware biscuit requires great care and skill. Such products as bricks, tiles, etc. may be exposed directly to the flames, but this is not as a rule permissible with wares of better quality which must therefore be packed in fireclay boxes, known as saggars. The saggars are stacked in the ovens in piles and the flames allowed to play directly on to them. It is necessary to heat steadily and slowly so that the water present in the ware may not escape too rapidly and so damage the product. The ware shrinks as the water is given off, and if the heating is not uniform the ware will be deformed to such an extent that it might be thrown away.

Gradually the temperature of the furnace would be raised to 1200°C. When this has been attained the temperature is maintained nearly constant until the ware acquires the desired hardness. The duration of heating depends largely upon the nature of the article required.

12. Plan of Hovel Oven.

When the firing is finished, the oven is luted up and left in that condition for a

least 30 to 36 hours to cool uniformly. After this the ware is taken out.

The changes, which take place when white earthenware bodies are fired, are similar to those which occur in the firing of hard porcelain but vitrification is not allowed to proceed to the same extent. Less flux is therefore required and the firing temperature need not be so high.

GLAZING

In the manufacture of earthenware a glaze or glassy covering is essential, as the body of the ware is porous, and easily becomes dirty. Earthenware glazes fired at a somewhat lower temperature than the body, but very soft glazes fired at an exceptionally low temperature are unsirable, as they are very liable to crack and peel off, and are apt to be poisonous because of the soluble lead salts formed. Readily fusible glazes which are free from lead have not, as yet, proved commercially satisfactory.

As already noted, the glazes used for earthenware are chiefly composed of some of the following: borax, soda, potash, china stone, flint, whiting, china clay, and one or more lead compounds. As some of these substances are soluble in water, they could not be used in the ordinary methods of applying the glaze to the ware (i.e., by dipping), and such substances must, therefore, be converted into insoluble ones. This conversion is affected by fusing certain ingredients of the glaze together, thus forming insoluble silicates, alumina-silicates or boro-silicates, according to the substances present. This process is known as fritting, and the fused product is termed a frit.

TYPICAL MIXTURE OF FRIT

Borax	30 parts.
Cornish or china stone	30 ,,
China clay	5 ,,
Flint	15 ,,
Whiting	20 ,,

The frit mixture is placed in a reverberatory kiln and, when fused, is run into water which granulates it. If the granulation is properly effected there is no need to grind the frit before preparing the glaze.

Earthenware glazes are usually made of the following ingredients:—

	Parts.	Parts.
Frit	36	58
Cornish stone	40	16
White lead	24	22
Flint	—	4

The glaze is ground with water to an extremely fine powder in a ball-mill. and is carefully sifted through lawns of silk. It is then run into a blunger, fitted with electro-magnet to remove iron particles and then is converted into glaze-slip.

The glaze is next applied to earthenware which has been fired (biscuit) by dipping the article into the glaze slip. The ware being porous absorbs the water in the slip, leaving the article covered with a thin coating of glaze mixture.

The ware is then allowed to dry and is taken to the kiln, placed in saggers and fired until the glaze has fused to a uniform glassy covering.

DECORATION

The decoration of ceramic products may be effected in various ways and requires skill and experience. The colouring matters may either be introduced into the body or may be incorporated into the glaze before being applied. Coloured clays may also be used to form a portion of the article but sometimes the article decorated with paintings and reliefs of different colours.

To perform the operation the colouring matters are finely ground and mixed with oil of turpentine or with a solution of gum arabic in water. The articles are then painted and fired in a muffle kiln at a temperature of about 900°C.

Decorating with colours presents uch difficulties on account of high tem-:rature required in the operation. The gments commonly employed are as llows:—

Blue (cobalt oxide); Brown (ferric ide); Yellow (titanium dioxide); Green hromic oxide); Red (alumina and iromic oxide); Black (ferric oxide and balt oxide).

After this the articles are taken out d allowed to cool, when they will be ady for the market.

PORCELAIN

Porcelain is the best of all kinds of ttery. Its distinguishing feature is the ssession of a vitrified, impervious, and anslucent body. There are several rieties of porcelain, namely hard porce-in, soft or glassy porcelain, bone or ina porcelain, and unglazed porcelain.

Raw materials required for making ese different varieties of porcelain wares e kaolin, felspar, cornish or china stone, alk, magnesite, grog, lime ash, quartz, nd, etc.

Hard porcelain is made with a body mposed chiefly of kaolin, felspar and uartz, the proportions of each being djusted to produce the desired effect.

Typical mixtures as given by Martin's dustrial Chemistry Vol. II. consist of e following:—

	Sevres.	Chinese.	Berlin.
Kaolin	38	47	77
Felspar	38	15	23
Quartz	24	38	—

For electrical insulators, hard porcelain extensively employed. In this case, it ust be burnt at the highest temperature ssible, and the ware must be rich in llimanite.

The glazes used for hard porcelain are mposed of the same ingredients as the dy, but in different proportions, and chalk or marble is sometimes added so as to obtain a more fusible product.

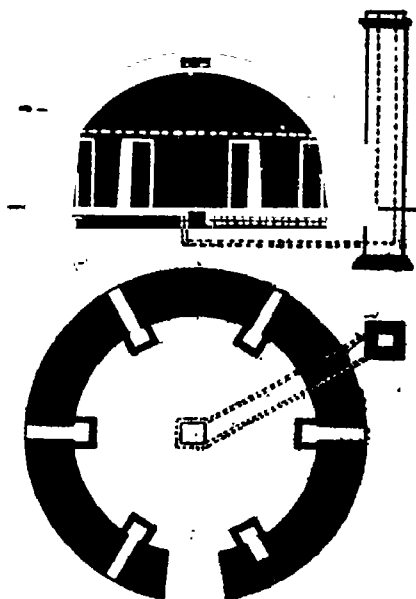
A typical glaze for hard porcelain is that of Sevres, which is made of:—

Ground hard porcelain (grog)	25	parts.
Quartz	42	,,
Chalk or marble	33	,,

or that of the Royal Berlin Works, which is made of:—

Plaster	8	parts.
Kaolin	28	,,
Quartz	57	,,
Marble	7	,,

Glassy porcelains are of little or no industrial importance.

Those made in France were composed of a calcareous clay or marl with a large proportion of fusible material, and closely resemble glasses of a complex character. In some cases so little clay was used that dextrin had to be mixed with the body to give it the necessary cohesion. The famous pate tendre of Sevres was made by fritting together.

13. Down-Draught Kiln.

Sand	60.0 parts.
Nitre	21.8 „
Sait	7.2 „
Alum	3.6 „
Gypsum	3.7 „
Soda	3.7 „

and mixing the frit thus formed with chalk and Argenteuil marl in the following proportions:—

Frit	75 parts.
Chalk	17 „
Marl	8 „

The composition of this porcelain closely resembles that of plate glass.

The glazes used for glassy porcelains are much more fusible than those for hard porcelains, and resemble the glazes used for earthenware. For French or glassy porcelain a typical glaze may be made by fusing together:—

Litharge	38 parts.
Sand	27 „
Flint	11 „
Potash	15 „
Soda	9 „

For bone china or English china, the body is now composed of:—

China clay	30 parts.
Bone ash	35 „
China stone	35 „

PROCESS OF MANUFACTURE

The mixing of the various ingredients composing the porcelain bodies is done in the same way as dealt with under earthenware and consists by essentially in grinding the various ingredients into the state of a fine powder, suspending them in water in the form of a slip or cream, mixing the various slips thoroughly together in the desired proportions, and then removing the surplus, water by means of a filter press. The filter cakes thus obtained are kept in cool cellars for the purpose of developing as much plasticity as possible, when the cakes are ready for use they are passed through a kneading machine or mixer. Electromagnets are sometimes used for removing the particles of iron.

It is necessary that the material used for the manufacture of each kind of porcelain should be mixed in the requisite proportions and with the necessary thoroughness, as, otherwise, the shrinkage in drying and burning will be excessive or irregular, and the ware will not have the properties characteristic of good porcelain.

The methods of producing articles from the composition vary considerably but comprise moulding, pressing, throwing and casting as described under the general processes.

After the articles have been produced by any of the foregoing methods they may be decorated and any inaccuracies in shape may be remedied.

The ware is next allowed to dry slowly, without cracking or warping, after which it is sent to the biscuit oven to be fired for the first time.

The object of the first firing is to harden the body of the ware, and to facilitate the application of the glaze. This is accomplished, in the case of hard porcelains at a temperature of 600°-700°C.

The glassy porcelains are fired to a temperature of 1100°-1150°C before glazing and china ware to about 1250°C but in both these classes of porcelain the glaze is fired at a lower temperature than the unglazed body—usually below 1100°C.

The temperature of the kiln must be raised very slowly and cautiously at first. At 500°-600°C when the clay begins to decompose, the heating must also be very carefully controlled, after a temperature of 850°C has been reached the rise may be more rapid. As the finishing temperature is approaching the greatest possible care is required, as a slightly excessive

temperature will cause a large quantity of the ware to collapse from over-heating. To produce good results, the ware must be maintained at an almost constant temperature for some time towards the close of the firing.

If the ware is to be decorated unglaze it is taken after the first firing to the decorators, otherwise it is ready for glazing.

The atmosphere should usually be reducing, so as to prevent the discoloration of the ware by any iron compounds which may be present.

The burned ware is sorted carefully, the proportion of damaged and useless material being large, except in the most carefully managed works.

On burning, the felspathic material melts first, and the molten portion then attacks the other constituents, forming less fusible substances. As the temperature rises, more fusion occurs and a point would, in time, be reached at which there would be so much fused material that the articles would begin to collapse. Firing is stopped just before this stage is reached, so that thin sections of hard porcelain, when viewed under a microscope are seen to consist of particles of calcined clay united together by means of a glassy substance. Minute needle-shaped crystals of sillimanite ($Al_2O_3SiO_2$) are formed at a temperature of about 1,200°C. and are a characteristic constituent of hard porcelains.

The application of the glaze to porcelain is usually effected by dipping the once-fired article in a suitable slip or slurry, as in the glazing of earthenware.

Where dipping is impracticable the glaze is painted on with a brush, some eight or ten coats being usually needed. As each coat must be allowed to dry before the next is applied this operation occupies a considerable time, and does not yield so even a coating as that on articles which have been dipped.

A perfect glaze adheres tightly and uniformly to the body; it has the same coefficient of expansion as the body, and shows no bare cracks or flakes. The glaze must not fuse too readily, or it will collect in drops instead of being uniformly distributed. The necessary conditions are best fulfilled when the glaze is not too low in alumina, as glazes which are free from alumina adhere badly to porcelain.

The glaze must be glossy, it must be completely fused whilst in the kiln, or when cooled must be transparent, free from bubbles and spots, and so hard that it is not scratched by steel. Porcelain owes most of its beauty, gloss, and cleanliness in use to its glaze, and to the great similarity between the glaze and the body. These characteristic can only be obtained in the most complete manner by the use of specially selected materials, and by firing both body and glaze at a much higher temperature than is used for earthenware.

When the coating of glaze is quite dry it is carefully rubbed, so as to remove any inequalities, and the ware taken to the placers, who fix it carefully and skilfully in saggers by means of suitable supports, so that none of the glaze is removed and the glazed parts are kept as free as possible from contact with other surfaces. The saggers, after being filled, are piled one above another in the oven.

The temperature to which the glaze must be fired depends, as already explained, on the nature of the porcelain. For hard porcelains it is the same as that of the body—about 1,200°-1,500°C.—but for chinaware and French porcelain it is much lower—about 1,050°-1,100°C.

The time required for firing in the glost kiln is naturally much less than if

the ware had not been previously heated. Even with the hardest porcelains it seldom exceeds forty hours, and a much shorter time is usually sufficient.

DECORATION

The colours used in the decoration of porcelain are similar to those used for earthenware but for underglaze porcelain the range of colours is severely limited by the high temperature at which the ware is fired.

The best underglaze colours used for porcelain are cobalt oxide for blues, chromium oxide for greens, uranium oxide for black and yellows, copper for red, and platinum, vanadium, and titanium for other colours. These various oxides are applied in the form of a thick fluid made by mixing them with turpentine, or they may be added to the glaze in the proportion of 2-5 per cent. of the latter.

The overglaze or muffle colours used on porcelain can be fired at temperatures to suit the tint required, and as they are quite independent of the ware a very wide range of colours is possible. These overglaze colours are usually prepared by fusing the colouring metallic oxide with a flux, such as a mixture of 6 parts of red lead, 2 parts of quartz, and 1 part of borax. The fused mass is ground to a fine powder, mixed with fat, oil of turpentine, and then painted on the glazed porcelain.

The chief colouring oxides are similar to those used for earthenware, and include:—

Blue overglaze—1 part cobalt oxide, 2 parts zinc carbonate, and 5 parts of flux. Other cobalt mixtures are also used.

Green overglaze—chromium or copper oxide.

Yellow overglaze—lead antimoniate, titanium oxide, uranium oxide.

Red overglaze—iron oxide or hydroxide prepared in various ways.

Carmine overglaze—purple of cassius, i.e., metallic gold precipitated on tin oxide or alumina.

Pink overglaze—chromium oxide precipitated on tin oxide or alumina.

Dark brown overglaze—manganese oxide.

Black overglaze—uranium oxide or metallic iridium.

White overglaze—tin oxide.

Silver overglaze—a mixture of gold and platinum. Metallic silver cannot be used.

Gold (as in gilding) may be produced by two methods: (a) A mixture of powdered metallic gold, bismuth oxide and oil is rubbed into a thin paste, and is applied to the ware with a brush. After burning, the gold is dull, but becomes glossy if rubbed with a burnishing tool. (b) A cheaper method consists in preparing a 15 per cent solution of gold in a sulphurous oil (gold balsam). This material produces a bright gold when burned, and therefore requires no burnishing.

The burning of overglaze colours is effected in muffle ovens or small tunnel kilns. The goods are carefully watched, and the heating is stopped or the goods are removed as soon as the glaze is sufficiently fused.

HOTEL CHINA

Hotel China is made from the highest grade raw materials, selected to give as nearly as possible a pure white colour. It combines the desirable properties of both the hard porcelains and bone china.

The hotel china body is predominantly clay, flint and feldspar, fired to complete vitrification, then covered with a fairly hard, resistant glaze. Decoration is often limited to simple bonding, used in conjunction with a crest or monogram for custom service.

The following are typical batch compositions fired to cone 10 to 12.

Ball clay	9.5	7.5	15.0	p.c.
Kaolin	33.0	37.0	28.3	,,
Flint	35.0	36.0	38.9	,,
Feldspar	21.0	18.0	14.8	,,
Docomite	1.5	—	3.0	,,
Whiting	—	1.5	—	,,

The body is prepared in a very painstaking manner. The non-plastic materials are first ground together in a ball mill until all will pass a very fine screen (such as 325-mesh). The plastics are carefully blunged into a thin slip and passed through a high-intensity magnetic separator to remove iron particles. then mixed with the non-plastics in the blunger. The resulting slip is again de-ironed, and may either be passed directly to a casting shop or filter pressed for jiggered bodies.

The fine particle size of the flint and the high alumina content of the body, combined with high firing, develop a large proportion of mullite crystals in the fired ware. These crystals, bonded together with a high silica glass, give hotel china its characteristically high strength (up to 0.45 ft.-lb. impact resistance). It is this high strength and low absorption that make American hotel china so suitable for public dining service.

SANITARY WARE

Sanitary ware is an important segment of pottery industry. It comprises a wide variety of closet-bowels, sinks, lavatories, urinals, and similar articles used for water supply, and general sanitation. Both vitreous and semi-vitreous bodies are used sanitary ware. Vitreous bodies are generally considered more satisfactory because, being impervious to water, they may be kept perfectly clean even though the glaze may become broken.

Vitreous bodies. normally made from clays, flint, and feldspar, are admirably suited to the slip casting process, and this method of ware forming is most commonly used in the manufacture of sanitary ware. In a few instances, the simpler shapes are dust-pressed in steel moulds. The intricacy of design, however, often leaves no other alternative than slip casting and it is through the sanitaryware branch that the ceramic industry has learned a great deal about this process of ware forming in the past decade.

The clay is crushed, mixed with water to form a soft paste. and is then moulded in plaster moulds, the work being done almost exclusively by hand. On removal from the moulds, the surface is smoothed with wooden and steel tools, any supplementary parts are fastened on by means of clay paste, and the goods are set aside to dry.

The glaze is usually leadless, and may be (a) salt glaze, or (b) composite glaze. A salt glaze is not applied directly to the goods. but is formed by throwing salt into the kiln towards the end of the firing.

Salt glazing usually produces dark brown ware. It requires a temperature of at least 1,100°C.

A composite glaze is applied directly to the goods, either by dipping them into it, or by painting, pouring or spraying it upon them.

There are many suitable glazes: one which is largely used consist of

Cornish stone	3	parts.
Felspar	1	part.
Whiting	1	,,
Flint	1	,,

When such a composite glaze is applied direct to stoneware the colour of the finished ware is commonly termed "cane," but in order to produce an agreeable tint it is usually necessary to add a little iron or manganese oxide to the glaze.

If white ware is required on a stoneware body, an intermediate slip or engobe

is used between the stoneware and the glaze. This engobe is composed of white-burning clays, with sufficient Cornish stone or felspar to enable it to adhere properly. The white engobe effectually covers the coloured stoneware, and makes the article appear as if made of white clay.

A method of casting large pieces of sanitary and other ware which has rapidly sprung into favour consists in the addition of a suitable alkali to the clay, agitating it mechanically with sufficient water to form a fluid slip, and then allowing this mixture to flow into a mould. By the use of a very small quantity—a fraction of 1 per cent—of a suitable alkali (or baryta) a mixture of clay with a considerable quantity of grog can be cast into vessels half-an inch or more in thickness.

ELECTRICAL PORCELAINS

The usefulness of ceramic bodies in the field of electricity is dependent solely upon the ability of ceramic products to resist the passage on an electrical current. In some cases the ability of the ceramic product to resist high temperature and its low expansion coefficient are also of considerable importance in electrical applications. In the main, however, the purely physical properties of ceramics, such as mechanical strength, heat conductivity, thermal shock resistance, and impact resistance, are not outstanding; they often are somewhat inferior to those of other materials which could be used if they had better electrical properties.

The bodies used for ceramic insulators (for brevity we are using the term "insulators" here to cover all electrical applications) may be very roughly divided into two classes: (1) the conventional electrical porcelain used for the great bulk of electrical fittings in household and industrial equpment, for both low-and high-tension work, and (2) a group of such special bodies as steatite, rutile, cordierite, high-alumina, and clinoenstatite, used chiefly in radio and radar equipment operated at high frequencies. Prior to the advent of radio, nominal steatite was used for insulation against low-frequency current. Since that time, steatite has been improved sufficiently to take care of high-frequency applications, while porcelain has been similarly improved, and now takes care of most low-frequency applications.

Ceramic high-frequency insulating materials are, basically, suitable for all uses in the field of high frequency, due to their prime characteristic which have been summarized by Gunzenhauser as follows:—

1. Vitrified, dimensionally exact insulating materials with high mechanical strength and high insulating qualities, and an especially low dielectric constant and low power factor—for general insulating purposes.

2. Vitrified insulating materials with high dielectric constant and low power factor—for condensers.

3. Vitrified insulating materials with low thermal expansion—for the construction of temperature-independent oscillating circuits.

4. Insulating materials with low dielectric constant and low power factor—for use in electronic tubes.

LOW-TENSION PRODUCTS

Low-tension equipment may here be considered as that operated in the home, on the farm, and for routine power loads in factories, mines and similar establishments. Such applications are powered with either alternating or direct current, supplied at voltages usually not over 440. For home and farm use, 60-cycle, 110-volt alternating current seems to be most used as a means of power supply.

Table 11-1. Typical Electrical Porcelain Bodies.

Component	Body A	B	C	D	E	F
Ball clay (per cent.)	10	35	20	18	11	14
Kaolin	28	18	20	17	28	27
Feldspar	35	24	40	33	34	26
Flint	25	21	10	10	26	33
Talc	2	—	—	—	1	—
Whiting	—	2	—	—	—	—
Pyrophyllite	—	—	10	22	—	—
Fire to Cone	9	10	11	12	12	14

Practically all equipment utilizing current of this type may be equipped with insulators made of the conventional electrical porcelain type body. In Table 11-1 are given representative body compositions for several commercial products of this sort.

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—PHARMACEUTICAL RECIPES

LYSOL

Cresol	500	c. c.
Linseed oil	180	grms.
Potassium hydroxide	42	"
Distilled water sufficient to produce	1000	c. c.

Dissolve the potassium hydroxide in 250 c. c. of distilled water, add the linseed oil, and heat on a water-bath, mixing thoroughly; continue to heat until a small portion dissolves in water without the separation of oil drops, add the cresol, mix thoroughly, and add sufficient distilled water to produce the required volume.

COMPHORATED SULPHUR OINTMENT

Sublimed sulphur	1	oz.
Carbolic acid	1½	"
Resorcin	1½	"
Camphor	1½	"
Solution of coal tar	2½	"
Lard	21	"
Soft paraffin	21	"

Melt the lard and soft paraffin and then incorporate other ingredients after removing from the source of heat.

TONIC TABLETS

Calcium hypophosphites	50	grains.
Manganese hypophosphites	25	"
Potassium hypophosphites	25	"
Iron hypophosphites	25	"
Quinine hypophosphites	12½	"
Strychnine	5/8	grain.
Potato starch, in powder	200	grains.
Sucrose, in powder, to make	350	"

Mix the hypophosphites of calcium, manganese and potassium with strychnine, and grind well together in a mortar. Dissolve the iron hypophosphite in a little water, granulate the mixed powders with the solution, and dry the granules. Powder the dried granules, and pass together with the starch, through a sieve, and make up to the required weight with sucrose. Make into 800 sugar-coated tablets

COUGH DROPS

Brown sugar	10	lbs.
Tartaric acid	2	oz.
Cream of tartar	½	"
Water	3	pints.
Anise-seed flavouring	q. s.	

Melt the sugar in the water, and when at a sharp boil add the cream of tartar. Cover the pan for 5 minutes. Remove the liq. and let the sugar boil up to crack degree i.e., if a quantity of syrup is allowed to drop on the cool floor it at once sets to a hard mass. At this stage turn out the batch on an oiled stone slab, and when cool enough to handle mould in the acid and flavouring. Pass it through the acid drop rollers, and when the drops are chipped up, and before sifting, rub some icing with them.

SCURF POMADE

Salicylic acid	30	grains.
Borax	15	"
Soft paraffin	1	oz.
Balsam of peru	30	grains.
Oil of cinnamon	3	drops.
Oil of bergamot	10	"

Mix.

DIGESTIVE MIXTURE

Sodium bicarbonate	160	grs.
Bismuth carbonate	160	"
Sodium sulphocarbonate	120	"
Powder of tragacanth	40	"
Spirit of chloroform	2	fl. dr.
Tinct. of cardamom Co.	4	" "
Peppermint water to produce	8	" "

Make into an emulsion.
Make 8 doses.

LIQUID MEDICATED SOAP

Coconut oil	1	oz.
Potassium hydroxide	1	dram.
Sodium hydroxide	1	"
Thymol	5	grains.
Distilled water to produce	6	ounces.

Dissolve the sodium hydroxide in one ounce of distilled water and dissolve in a separate vessel the potassium hydroxide in another ounce of water. Now place the coconut oil in a suitable pot and pour the sodium hydroxide solution stirring vigorously until all the sodium compound has been absorbed by the oil. Then add the potassium hydroxide solution and again stir so as to saponify the whole of the coconut oil. Then incorporate the thymol and allow the soap to stand for 15 minutes. Afterwards add the remainder of the distilled water.

—Recipes for Small Manufacturers

AUTOMOBILE SOAP

Corn oil, crude	54.7	lbs.
Caustic potash	9.2	„

Dissolve the caustic potash in 30 lbs. water and add it to the oil slowly with stirring. Bring to a boil and then add water to bring to strength desired.

To colour green add 5 grams. of alizarine green per 100 lbs. of soap.

PAINT BRUSH CLEANER

Kerosene oil	2	parts.
Diglycol oleate	1	part.
Ammonia	½	„
Alcohol	½	„

Place brush in above overnight and then wash well with water.

GASKET GREASE

Potash soap	22	parts.
Glycerin	6	„
Castor oil, heavy	72	„

Heat together, with stirring to 121°C. Turn off heat and stir till temperature falls to 38°C. Pour into containers.

BLACK TYPEWRITER RIBBON INK

Nigrosine	5	parts.
Oleic acid	25	„
Carbon black	15	„
Mineral oil	55	„

Grind thoroughly before applying to ribbon fabrics.

MOSQUITO REPELLING OIL

Cedar oil	2	fl. oz.
Citronella oil	4	„ „
Spirits of camphor	8	„ „

Just shake together in a dry bottle and it is ready for use. This preparation may be smeared on the skin as often as necessary to repel mosquitos and other insects.

BLUE-BLACK WRITING INK

Naphthol blue-black	1	oz.
Gum arabic, powdered	½	„
Carbolic acid	½	„
Water	1	gallon.

Stir together in a glass or enamelled vessel until dissolved.

DRY FIRE EXTINGUISHER

Ammonium sulphate	15	oz.
Sodium bicarbonate	9	„
Ammonium phosphate	1	„
Red ochre	2	„
Silex	23	„

Use powdered materials only; mix well and pass through a fine sieve. Pack in tight containers to prevent lumping.

MALTED MILK POWDER

Powdered malt extract	5	oz.
Powdered skim milk	2	„
Sugar, powdered	3	„

Mix thoroughly by shaking and rolling in a dry can. Pack in an air-tight container.

HAIR TONIC

Isopropyl alcohol	70.0	oz.
Propylene Glycol	5.0	„
Eau-de-Cologne	5.0	„
Cholesterin	0.5	„
Perfume	0.5	„
Distilled water	19.0	„

Dissolve all the ingredients except water in isopropyl alcohol, add the water last.

GLASSINE PAPER

Paper is coated with or dipped in the following solution and then hung up to dry.

Gum copal	10	oz.
Alcohol	30	fl. oz.
Castor oil	1	„ „

Dissolve by letting stand overnight in a covered jar and stirring the next day.

BOILER COMPOUND

Soda ash	87	oz.
Trisodium phosphate	1	„
Starch	1	„
Tannic acid	2	„

Use powdered materials, mixing well and then pass through a fine sieve.

SOFT SOAP

Linseed oil	25	lbs.
Groundnut oil	25	„
Rosin	5	„
Caustic potash lye 22°Be	50	„
Caustic soda lye 22°Be	14½	„
Pearlash	2½	„

Take the oils and rosin in an iron vessel and heat. When the temperature is about 100°C slowly run in the caustic potash lye with constant stirring. Add water small quantity at a time to make up the loss of water caused by evaporation. When the mass fobs add the caustic soda lye and continue boiling. Take care that the oil mixture does not boil over. When the oils and lye are well-amalgamated add the pearlash dissolved in 5 lbs. of water so as to keep the mass thin. When the soap is clear and transparent, it is ready to be poured in suitable container.

—IN THE FIELD OF INVENTION

NEW WOOD PRESERVATIVE

Joint research by the Koppers Co., Inc., and du Point de Nemours and Co., is reported to have resulted in the development of a new wood preservative, namely, copperised chromated zinc chloride. Tests are said to have shown that the new material is active longer than ordinary CZC. It contains 73 per cent. zinc chloride, 20 per cent. sodium bichromate and 7 per cent. cupric chloride.

—CHEMICAL PRODUCTS.

PYRETHRIN SUBSTITUTES

The synthesis of new pyrethrin-like compounds has been announced from the laboratories of the Bureau of Entomology and Plant Quarantine. U.S.A. (Chem. Age, 1949, 60,484). The chemical composition of the synthetic materials is stated to be identical with that of the active principle in pyrethrum. The material will not break down as quickly as the natural product. One of the compounds tested is reported to be 6 times more powerful in its knock-down action than the toxic principles from pyrethrum flowers.

Starting materials for the synthesis are pyruvic aldehyde and aceto-acetic ester. Basis of the first of these is propylene glycol and the second is made from ordinary alcohol and acetic acid.

SOIL CLASSIFICATION IN U.S.A.

The system of soil classification developed through years of research and now used throughout the United States makes it possible to apply techniques of modern agricultural science to individual farms, according to a report of the U. S. Department of Agriculture.

Because soils differ widely within any area, the success of the application of new research findings on a given farm cannot be predicted accurately unless soils at the research station and at the farm are classified in terms that permit comparison.

On the basis of field and laboratory experiments conducted during 1912 to 1935, a new concept has been formulated. The process of soil formation in different environments are so unlike that soils developed from similar rocks in different places have widely different characteristics and behaviour.

In defining soil types, the characteristics taken into consideration are surface slope, texture, stoniness, fertility, depth, drainage, acidity, and presence of impervious layers.

More than 8,000 different soil types have been identified. In soil survey reports, the different types in a particular area, usually a single country, are classified, shown on maps, and described. A sandy loam is described as a poorly drained, acid, sandy soil, with no layers that cannot be penetrated by water and plant roots. It requires drainage to lower the water table, is deficient in plant nutrients, and needs heavy fertilization to produce high yields of most crops.

Such classification furnishes an accurate and orderly basis for assembling in usable terms the results of research and the experience of farmers. It permits prediction of crop adaptability, probable yields, and management requirements of specific areas of land, Experimental results of farmers' experience with one type of soil may have little or no prediction value for other soil types. Soil classification provides a means of showing the types of soil on any piece of property so that farmers may choose used practices that experience of research has shown to be suitable to these soil types. It has played a major role in the development of programme for soil improvement and conservation and for the prompt and effective adjustment of agriculture to meet fluctuating economic conditions and emergencies (U.S.I.S.).

IMPROVED TYPE OF PLOUGH

The Indian Agricultural Research Institute has evolved a new plough which, with a single pair of bullocks, is capable of doing twice the work done by the existing standard plough.

The new plough is simple in construction and consists of two standard desi ploughs, suitably coupled by an iron frame-work and pulled by a single central beam. The ploughs are so spaced that identical furrows are cut, and they carry out in one operation the work which would be performed in two operations by the standard plough. The plough is comparatively light, its weight being only about 50 p.c. heavier than the standard plough. Trials show that the draught did not exceed 260 lbs. as against the normal draught of 155 lbs. of a standard plough. The additional draught of the new plough is not likely to be heavy for bullocks as experience has shown that so far as ploughing is concerned bullocks are usually underloaded.

The quality of ploughing is also improved. Seasoned ploughmen who have used the new plough are enthusiastic about it and state that it is easier and less tiresome to operate due to its stability.

Besides its simplicity in construction, the new plough is comparatively economical, its cost being about 50 per cent. more than the standard plough. It can be easily repaired and fabricated.

—JOURNAL OF SCIENTIFIC & INDUSTRIAL RESEARCH.

—FORMULAS, PROCESSES & ANSWERS

BENDING GLASS TUBES

3828 A.P.W., Bombay—Desires to know process of bending glass, etc.

The guiding principle in this operation to ensure a smooth. round bend is to soften lightly a length of tube equal to at least three times its own diameter for a right-angle bend. It is then an easy enough task to be accomplished in a flame wide enough for the purpose, whether it be a special fish-tail burner or only the blowpipe flame adjusted to give a large smoky flame. In the use of the latter, care must be taken to soften the glass uniformly and slowly. There are, however, two distinct ways of effecting this operation. The first one is practised with small-bore tubes of comparatively thick walls that do not collapse easily, when a length of tubing is lightly softened, enough to be gently and gradually forced to the required shape. This is evidently the method of the inexperienced. The second one is that of the professionals, and requires considerable skill and experience when attempted on tubes of thin wall and large bore. For a nice U-bend, a length of about five times the diameter of the tube has to be melted down and gathered to form an elongated thick bulb in the middle of the tube. After a strong heating the operator pulls this apart gently, at the same time bending the tube to the required shape and blowing in all the while to expand it to the diameter of the rest of the tube, all these operations being simultaneously before the glass loses its heat. Even then it may require local correction.

INK FOR GLASS ETCHING

Equal parts of hydrochloric acid, fluoride of ammonia, and dry precipitated barium sulphate are rubbed together in a porcelain mortar. When intimately mixed, the mass is tansferred to a dish made of gutta-percha and fuming hydrofluoric acid is poured over it and rapidly stirred with a gutta-percha rod shaped like a pestle, until the impression left by the rod quickly vanishes. Glass written with this ink is etched immediately, and the etched portions are so beautifully roughened that they are visible at a long distance. The ink only needs to act for 15 minutes on the glass, and a longer action may be harmful, as the edges lose their sharpness. In making good etching ink, the quality of the barium sulphate is of great consequence. It must be prepared by precipitating the solution of barium chloride with an excess of sulphuric acid, washing well by decantation filtering, and drying at 240°F. It is only in this manner that it can be obtained sufficiently fine and impalpable.

Concentrated hydrofluoric acid may cause serious inflammation and even ulcers if left in contact with the skin for some time, so that care should be taken both in making and using the ink not to touch it with the fingers.

DRILLING GLASS PLATE

To drill a ½ in. hole in a glass plate, make a hole in a piece of wood or metal of the size that you desire to drill in the glass. Fasten it with beeswax upon the glass for a guide. A piece of brass or copper tubing, quite thin, is supplied with emery and water and twirled between the fingers or with a bowstring. This will cut a hole in a few minutes. You can feed the emery and water a little at a time through the tube.

BOTTLE CAPS.

3899 G.V.R., Hapur—Wants to have a recipe of bottle caps.

Gelatin	27 grams.
Water	43 c.c.

Allow to swell overnight and warm gently with stirring until uniform. Then add:

Glycerin	10 grams.
Water-soluble dye	2 „
Water	18 c.c.
Formaldehyde.	trace.

Dip the neck of the bottle into the composition. Take out and dry in air.

TABLE VINEGAR.

3916 K.D., Mhow—Desires to know the formulas and processes of making table vinegar, malt vinegar, etc.

Ginger	1 oz.
Pimento	1 „
Long pepper	3 „
Black pepper	302 „
Mustard	3 „
Vinegar	8 pts.

Bruise the spices and simmer gently in the vinegar for 10 minutes, cool and strain. The vinegar prepared in this way is used with any vegetable.

MALT VINEGAR.

Bruise 200 parts of large raisins, 12½ parts of cream of tartar, and 100 parts of wheat malt, and work them to a stiff paste by adding hot water. Let this stand for half-an-hour, then pour 1800 to 2000 parts of hot water over it, and let it stand for 3 hours. Now pour it in a barrel provided with a faucet and standing near a warm stove. When the mixture is as warm as the hand will bear, add 300 parts of yeast and stir thoroughly. After 3 hours, when all the yeast is fermented, add 400 parts of

sharp wine vinegar; let it stand for 24 hours, and then draw off the fluid. Remove the yeast and cleanse the barrel by rinsing with water. Replace the fluid in the barrel, bung tightly, and let it stand quietly for 14 days, when the vinegar will be sour. After it has been laid for 6 weeks draw it off, and to improve the vinegar repeat the operation several times. Vinegar thus prepared is nearly equal to the best wine vinegar.

TOFFEE.

Take 2 lbs. sugar and 150 cashewnuts; skin the latter like almonds, in hot water, and chop up with a knife or mincing machine. Make a syrup of sugar with 2 tumberfuls of water, then add nuts and cook till the whole crystallises, put into a filtered plate and, when partly set, cut into squares or diamond shapes.

BLUE-BLACK FOUNTAIN PEN INK

Tannic acid	2¼ oz.
Gallic acid	1 „
Ferrous sulphate	3¼ „
Hydrochloric acid dilute	2½ fl. oz.
Gum Arabic	2 oz.
Carbolic acid	75 grms.
Acid blue	¼ oz.
Distilled water to make	100 „

Dissolve the tannic and gallic acids in 5 oz. of distilled water. Dissolve the ferrous sulphate and gum arabic in about 20 oz. cold water. Add the hydrochloric acid and immediately mix the two solutions.

Add the carbolic acid, acid blue and sufficient water to produce 100 ounces. Keep aside for a fortnight; then filter and bottle.

CIGARETTE LIGHTER

4000 G.S., Jhansi—Wishes to have a formula of making cigarette lighter.

The flints are cylindrical in shape and contain a large proportion of cerium. Alloys of cerium with either 30 per cent. iron or 12 per cent. magnesium are made. Put cerium metal 88 parts with magnesium 12 parts or cerium 70 parts with iron 30 parts in a crucible and melt these by means of strong heat. Now pour these alloys to suitable moulds.

SYRUP HYPOPHOSPHITE OF LIME

4002 S.N.P., Sagauli—Wishes to know a good recipe of preparing syrup hypophosphite of lime.

Calcium hypophosphite	35 grams.
Hypophosphorous acid	1.5 c.c.
Sucrose	775.0 grams.
Distilled water sufficient to produce	1000 c.c.

Dissolve the calcium hypophosphite with the aid of the hypophosphorous and in 500 c.c. of the distilled water, filter the solution, add the sucrose to the filtrate, and after this has been dissolved by agitation, add sufficient distilled water to make the product measure 1000 c.c.

P.O.P. PAPERS

(a) 4 per cent. cellaidin collodion, 620 c.c.; sulphuric ether 100 c.c.; alcohol (.796) 30 c.c. (b) Silver nitrate 25 grains; distilled water 25 c.c.; alcohol (.796) 120 c.c.; (c) Calcium chloride crystals 4 grains; distilled water 4 c.c.; alcohol 5 c.c. (d) Citric acid 5 grains; distilled water 5 c.c.; alcohol (.796) 30 c.c. (e) Castor oil solution (1 of oil in 2 of alcohol) 15 c.c.; glycerine (glycerine 1; alcohol 2) 15 c.c. Now add (b), (c), (d) and (e) to (a) in this order with thorough shaking. Coat on barytafaced paper and allow to dry. The operation must be conducted in darkness. This gives paper especially suitable for separate toning baths.

BLUE PRINT PAPER

R. V. N., Poona—Wishes to have recipes of blue print paper and French polish.

Oxalic acid	50 gr.
Ferric chloride	100 „
Distilled water	30 „

Coat and dry in dark room—develop in water.

INSECT POWDER

4051 G.S.R., Madura—Wants to have a formula of insect powder.

The ordinary insect powder of commerce is made from pyrethrum carneum, pyrethrum roseum, and pyrethrum clorriae-folium. The first two are generally ground together forming the Persian insect powder of commerce while the third is known as Dalmatin insect powder.

The powder is obtained by crushing the dried flowers of the pellitory (pyrethrum). The leaves, too, are often used. They are cultivated in the Caucasus from where the articles are exported.

The following insect-powder formulas are perfectly safe to use.

I.

Insect powder	8 oz. av.
Powdered borax	8 „
Oil of pennyroyal	2 fl.drachm.

Take the ingredients in fine powder and then mix them intimately in a stone mortar; finally pass through a sieve to ensure thorough mixing.

II.

Insect powder	8 oz. av.
Borax	8 „
Sulphur	4 „
Oil of pennyroyal	2 fl. dr.

Procedure:—As in I.

INJECTION OF QUININE DIHYDRO-CHLORIDE

4063 H.C., Amritsar—Desires to know the formulas of preparing injection of quinine dihydrochloride and liniment of turpentine.

Injection of quinine dihydrochloride is a sterile solution of quinine dihydrochloride in water. The solution should be sterilised by heating in an autoclave, or by filtration. The content of quinine dihydrochloride is not less than 92.0 per cent.

LINIMENT OF TURPENTINE (B.P.)

Soft soap	75	grams.
Camphor	50	„
Oil of turpentine	650	mils.
Distilled water, sufficient to produce	1000	„

Mix the soft soap with 100 mils. of distilled water; dissolve the camphor in the oil of turpentine; gradually add the camphor solution to the soap mixture, triturating until a thick creamy emulsion is formed, add sufficient distilled water to produce the required volume, mix.

CURRY POWDER

4070 A.B., Bombay—Desires to have recipes of curry powder, Worcestershire Sauce, etc.

Coriander	4	oz.
Turmeric	4	„
Cinnamon	2	lbs.
Cayenne	8	oz.
Mustard	1	lb.
Ginger, dry	1	„
Allspice	8	oz.
Fenugreek	2	lbs.

All ingredients should be dry. Grind to fine powder and sift through a fine-mesh sieve. Mix thoroughly. Pack in airtight, moisture-tight container to avoid loss of flavour.

WORCESTERSHIRE SAUCE

Pimento	2	drachms.
Clove	1	drachm.
Black pepper	1	„
Ginger	1	„
Curry powder	1	ounce.
Capsicum	1	drachm.
Mustard	2	ounces.
Shallots, bruised	2	„
Salt	2	„
Brown sugar	8	„
Tamarinds	4	„
Sherry wine	1	pint.
Wine vinegar	2	pints.

The spices must be freshly bruised. The ingredients are to simmer together with the vinegar for an hour, adding more of the vinegar as it is lost by evaporation; then add the wine, and if desired some caramel colouring. Set aside for a week, strain, and bottle.

DELUSTERANT FOR ARTIFICIAL SILK

4117 I.C.K., Surat—Wants to have a formula of delusterant for artificial silk.

Barium chloride	40	parts.
Anhydrous zinc sulphate	26	„
Dextrin	22	„
Starch	12	„

All ingredients should be finely powdered and intimately mixed.

PIN WHEELS

4129 S.R.M., Kumbakonam—Desires to know the process of making pin wheels and blue stars.

First prepare the composition as follows:—

Mill powder	10	parts.
Fine grain gun powder	5	„
Saltpetre	4	„
Steel filings	6	„
Sulphur	1	part.
Charcoal	1	„

Mix.

Now take several pieces of Kraft paper and cut them into strips 4" wide and 12" long. Roll them into short tubes getting the opening at one end somewhat larger than that at the other. This may be done by rolling a V-shaped strip of paper on one end of rod. When a quantity of these tubes have been rolled close. the smallest end by twisting or folding it over. Dry them and fill up each tube with the powder mixture. Jolt the tubes occasionally to be sure none are only partly filled. Then close the top end and wrap them all in a wet towel for several hours. When they are dampened and rolled out punch out a lot of round pieces of strawboard, with a hole through their centre. Then get a piece of brass, the same size as the cardboard centres and fasten it to the work table. Lay one of the centres on this brass plate and taking a filled pin-wheel tube press the smallest flat end against its edge and twisting it around disc with the right hand while left hand feeds the tube as it is being wound on, continue until all the tube is rolled around the centre. The brass plate should be half as thick as the finished pin wheel so the cardboard centre will be held just about in the middle of the pin wheel while it is being twisted.

Now have some boards prepared with strips of wood ¼" square, nailed on them, the same distance apart as the width of a pin wheel when it is lying down. When the weight pin wheel is twisted up as above, lift it off the brass plate and set it between two of them strips on the board so as to keep it from untwisting and with a brush put a drop of glue across the pipes and into the centre disc, at four equidistant points. When they have dried they may be removed from the boards and are ready for use.

BLUE STARS.

Potassium chlorate	24	parts.
Paris green	9	"
Barium nitrate	8	"
Shellac	5	"
Dextrin	1½	"

Reduce the ingredients to fine powder separately. Then mix.

PRINTED COTTON FABRICS.

4285 T.K.S., Nagapattinam—Desires to have the process of printing cotton fabrics by hand block.

Preliminary preparation of cotton piece material for printing consists of:—

(1) Singeing, to remove the nap and produce a smooth surface. This operation is necessary to insure a uniform application of colour in the intended design.

(2) De-sizing. This is accomplished by saturating the cloth in a dilute but hot caustic soda solution. A thorough washing follows:—

(3) Kier boiling comes next which is usually given under a mild pressure for 5-7 hours at 5°Tw. caustic soda liquor. A thorough rinse and scouring in 0.3Tw. sulphuric acid follows and then a further rinse.

(4) Bleaching is carried out by passing the goods through a cold solution of sodium hypochlorite and then piled for 1-3 hours. A thorough rinse follows:—

After this, fabrics are sprinkled with the following:—

Victoria glue B	15	grms.
Acetic acid (30%)	75	"
Kromfax solvent	40	"
Hot water	170	"
Gum Tragacanth Starch Thickener	600	"
Tannic acid Fixer (50: 50 Tannic and acetic acid)	100	"

After printing and drying, the material is steamed for one hour without pressure and then treated with tartar emitic—10 grm. per 1000 c.c. at about 100—120°F.

Orange	40	grms.
Hot water	200	"
Gum Tragacanth Thickener	430	"
Dextrin	100	"
Acetic acid (30%)	50	"
Aluminium acetate 15°Tw	180	"

Print, steam for 30 minutes, no pressure and treat warm to remove gum. No further rinsing.

Other colours suitable are:—
Chinoline Yellow N.
Naphthol Yellow S.
Crystal orange.
Brilliant crocine.
Scarlet 2 R.
Soluble blues.
Fast Green 3 G.

TRIPOLI BUFFING STICK.

4340 P.E.W., New Delhi—Desires to know a formula of Tripoli buffing stick.

Double pressed stearic acid	3	oz.
Tallow	2½	"
Hard paraffin	2½	"
Tripoli powder	2	"

Melt the stearic acid, tallow and hard paraffin over slow fire. Then incorporate the tripoli powder and pour in suitable moulds.

SURMA.

4194 S.C., Kanpur—Wants to know the preparation of surma, asokarist, etc.

It is trisulphide of antimony. It is commonly known to chemist as black antimony sulphide and in Hindi as Surmaka-pathar. It is found in the native state in Vizianagram and in several parts of the Punjab. The mineral is purified by fusion. It is then reduced to a black powder. The powder thus obtained is commercially known as surma.

ASOKARIST.

Bark of Saraca Indica (Asokatwak).

Boil in 256 seers of water, down to 64 seers strain and add to the decoction.

Treacle (Guda)	200	palams.
Flowers of Woodfordia Flooribunda (Dhataki)	16	"
Nigella Sativa (Krishna-jiraka)	1	palam.
Cyperus rotundus (Mustaka)	1	"
Dry Ginger (Sunthi)	1	"
Berberis Asiatic (Darvi)	1	"

Roots of Nymphoea Stellata (utpala Red Flower) 1 palam.
Chebulic myrobalans (Haritaki) 1 „
Emblic myrobalans (Amlaki) 1 „
Beleric myrobalans (Vibhitaka) 1 „
Kernel of mango seeds (Amrabija) 1 „
Cumin seeds (Jiraka) 1 „
Root Bark of Justicia Adhatoda (Vasaika) 1 „
Red Sandalwood (raktachandana) 1 „

GILDING BOOKS.

4297 R.N.B., Calcutta—Wants to learn a process of gilding edges of books.

To gild books with letters and figures gum mastic, in fine powder, is dusted over the surface to be gilded; an iron or brass tool bearing the design upon its face is then heated to a proper temperature, and gently pressed upon a piece of leaf gold, which adheres to it; the two are then transferred to the cover and the tool is generally pressed on it, by which means the mastic softens and retains the gold. The loose gold and powdered mastic are then dusted off with a brush. Gold leaf will adhere to leather without the use of mastic, but not so firmly as when it is employed. The edges of the leaves of books and paper can be gilded in the following manner. The edges are cut perfectly smooth, and then washed over with a solution of isinglass in weak spirit, or with a varnish made of Armenian bole 4 parts and powdered sugarcandy 1 part, mixed up to a proper consistence with strained white of eggs. The coating is allowed to dry, and is then smoothed with a wet rag, after which the gold leaf is applied and polished with the burnisher.

Silvering book edges may be done in the above manner by taking silver leaf instead of gold leaf.

CAUSTIC SODA FROM REH.

4328 S.P., Ballia—Wishes to know the process of preparing caustic soda from reh.

500 parts of sajji (reh) is dissolved with 2600 parts of water; and 183½ parts of freshly prepared lime (calcium oxide) dissolved with three times of its weight of water is added to the boiling reh solution gradually with vigorous stirring. By this treatment about 92.4 per cent. of carbonate present in the reh is converted into caustic soda, the specific gravity of the resulting liquor being 23 Tw. The clear liquor is next separated from the lime mud and concentrated. As the reh contains some appreciable amount of sulphate of soda it is first crystallised out because it is less soluble than caustic soda. The crystal which first forms is mainly sulphate and is removed. The mother liquor which is now almost free from sulphate is further concentrated and ultimately evaporated to dryness in nickel vessels. The substances thus obtained is finally fused over moderate fire. In this way a practically colourless caustic soda may be obtained, the organic matter present being destroyed during fusion.

PREPARATION OF GHEE.

4349 N.H.N., Kampala—Desires to know a process of making ghee.

Ghee is made by heating butter at a gentle heat until it is freed of all water. This stage is noticed by total stoppage of the sound of boiling water when the ghee pot should be removed from the fire and allowed to cool. Strong heat may cause a partial charring and consequent bad smell of the ghee. While the ghee is still liquid and warm it should be strained through a piece of moist clean linen and then kept covered in tinned pots or earthenware in a cool place. Ghee made from fresh butter keeps well for a long time while that made from spoiled butter is spoiled in a very short time and smells bad. Market ghee always contains a small amount of water or butter milk. If wataer or butter milk is left in the ghee some fats are readily decomposed and the ghee is turned rancid. In order to prevent this, best way is to purify it. A good method of purifying is given below:—

Take the ghee in a deep iron vessel along with twice its weight of water. The vessel is then gradually heated and the ghee is stirred constantly with a ladle.

By this process, all the organic matter derived from the milk is gradually taken up by the water. The stirring is continued till the water begins to boil. The mixture should be allowed to boil for about 5 minutes, when it is allowed to cool to a certain extent and the ghee collects as a clear layer at the top. It is taken out by means of a shallow vessel or ladle and poured through a thick linen filter when the remaining impurities are removed. The last portion of the impurities which cannot be separated from water is again taken with a fresh charge.

—BRIEF QUERIES AND REPLIES

Questions of any kind within the scope of Industry are invited. Enquiries or replies from our experts will be published free of charge in serial order. Questions are replied by post on receipt of As. 8 stamps for each question. Subscribers outside India are requested to send two International Reply coupons for each question. In order to facilitate the work of Editor's Department and to help prompt action the readers are requested to send enquiries in separate letters.

1953 B.P., Sonepeta—For printing and allied machines enquire of Printing & Industrial Machinery Ltd., Windsor House, P-14, Bentinck Street, Calcutta and John Dickinson & Co., 6, Clive Row, Calcutta.

1954 O.P., Amritsar—We have no book on neon sign and allied industries.

1955 N.Z.K., Bhion—We have no book on photography and aerated water manufacture.

1960 S.D.S., Saharanpur—The root and wood of berberis aristata contain a yellow alkaloid berberine, a bitter substance, which dissolves in acids and forms salts of the alkaloid. It is tonic, stomachic, astringent, antiperiodic, diaphoretic, anipyretic and alterative. It is not anti-pyorrhoea astringent as mentioned by you. You may use methyl salicylate in tooth powder.

1961 M.A.J., Samalkot—You may send samples of powder to Industrial Research Laboratory, 22, R. G. Kar Road, Calcutta 4.

1967 R.L.N., Delhi Cantt.—Formula of balmdhup, surma, etc. will appear in Formula Section in due course.

1970 K.S., Nairobi—Process of manufacturing dry ginger and mottled soap will appear in Formula Section in due course.

1971 K.B.B., Farrukhabad—Names of districts of India and Pakistan will be found in Industry Year Book and Directory published from this office.

1972 N.T., Lahore—For English types enquire of John Dickinson & Co., 6, Clive Row, Calcutta.

1974 R.D.P., Matugama—For advertising tape enquire of Eagle Advertising Tape Factory, 5, Eagle Wadi, Kurla, Bombay and Lakshmi Advertising Tape Factory, 73, Apollo Street, Bombay. Process of manufacturing artificial school slate will appear in Formula Section in due course.

1976 S.R.G., Coonoor—You may start a bakery; ink manufacture; agarbatti manufacture, etc. In this connection you may consult Home Industries and Manufacture of Inks—both the books published from this office, price Rs. 3-7 each including postage.

1978 W.C.S., Ludhiana—After taking from the bleaching solution wash the leather thoroughly with water.

1979 S.S., Fatehgarh—Sheet metal working machine may be had of Alfred Herbert (India), Ltd., 13-3, Strand Road, Calcutta.

1981 N.R.S., Bombay—Following is a formula of moulding powder: Powdered shellac 30 lbs; Kaolin 32.5 lbs; barytes 32.5 lbs; bone black 5 lbs. You may start plastic industry with Rs. 25,000. For glycol oleate enquire of Kaisers Trading Co., 159, Lower Chitpore Road, Calcutta.

1985 N.S., Coimbatore—Cream separators may be had of Edward Keventers Ltd., 11-3, Lindsay Street, and Volkart Bros., 8, Netaji Subhas Road, both of Calcutta.

1986 K.R., Madras—We have no book on hotel management. You may however enquire of Thacker Spink & Co. (1933), Ltd., 3, Esplanade East, Calcutta and Standard Literature Co., Ltd., 13-1, Old Court House St., Calcutta.

1987 M.A.M.C.S., Shimoga—Process of manufacturing scented arecanut powder will appear in Formula Section in due course.

1988 G.C., Lahore—A formula of depilatory soap will appear in usual course.

1989 G.P., Gurgaon—Cigarettes may be had of Imperial Tobacco Co. of India Ltd., Virginia House, 37, Chowringhee, Calcutta and Mohammed Yusuf, 59, Canning Street, Calcutta. Tea may be had of B.K. Saha & Bros. Ltd., 5, Pollock St. and Excel Tea Co., 77, Harrison Road; both of Calcutta.

1991 R.C.H.P., Tekkali—Address of Hindusthan Musical Syndicate of Calcutta is not available. Address of Hindusthan Musical Products Ltd., is 6/1, Akrur Dutt Lane, Calcutta 12.

1992 B.B.J., Katmandu—For tractors enquire of Ford Motor Car Co., of India Ltd., 2, Justice Chandra Madhab Road, Calcutta.

1993 H.C.I., Jubbulpore—Prepared chalk may be had of Calcutta Chemical Co. Ltd., 10,

Bonfield Lane, Calcutta and Indian Mineral Industries Ltd., 22, Dum Dum Road, Calcutta.

2000 A.G.C., Bombay—In order to make plug waterproof you should use potassiom dichromate 5 per cent. of the glue used.

2001 B.K.D., Shillong—We have no book on bone meal making and handloom weaving. We think these two industries have good prospect in Assam.

2002 A.K.. Ramchandrapur—You may start a groundnut oil mill at your place if groundnut is available in large quantity there. For oil expellers and motors enquire of Marshall Sons & Co., Ltd., 99, Netaji Subhas Road, Calcutta.

2003 K.B., Sevoke—You may start handloom weaving industry. You should weave cotton, silk and wool. This will be profitable industry.

2004 K.C.K., Kashipur—Litharge and red lead are manufactured by D. Waldie & Co. Ltd., 8, Netaji Subhas Road, Calcutta. Lead ore is not found in India. You may consult Dictionary of Chemicals by Thorpe.

2005 B.S., Cuttack—For white oil enquire of Bepin Behari Tah & Co., 2, Nawab Lane; Jagadhatri Taila Bhandar, 5, Nawab Lane and Shital Chandra Pal, 5, Nawab Lane; all of Calcutta.

2006 G.B., Agra—Paper pin making machines are not available in India. You may however enquire of Baird Machinery Co., Bridgeport, Connecticut, U.S.A.

2009 S.R., Hoshiarpur—You may consult Varnishes and Their Components by R.S. Morrell.

2011 N.A.G., Colombo—For aqua sambuci enquire of B. K. Paul & Co. Ltd., 1 & 3, Bonfield Lane and M. Bhattacharjee & Co., 80, Netaji Subhas Road; both of Calcutta.

2012 S.C.P., Ahraura—For machines enquire of Volkart Bros., 8, Netaji Subhas Road; Marshall Sons & Co. Ltd., 99, Netaji Subhas Road and Francis Klein & Co. Ltd., 1, Royal Exchange Place; all of Calcutta. We have no book on vitamins and vitaminising food.

2013 M.S., Gorakhpur—An article on plastic industry appeared in December 1948 issue of Industry. Machines and chemicals required for plastic industry may be had of Alfred Herbert (India). Ltd., 13-3, Strand Road, Calcutta and Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta.

2018 A.M.S., Dindigul—Refer your query to The Commercial Counsellor, C/o. The Indian Liaison Mission, Empire House, Marunouchi, Tokyo, Japan.

2019 R.V., Ludhiana—For homeopathic books and medicine enquire of C. Ringer & Co., Norton Bldgs., Lalbazar, Calcutta; King & Co., 90-7A, Harrison Road, Calcutta and M. Bhattacharyya & Co., 84 Netaji Subhas Road, Calcutta.

2020 S.P.B., Poona—We have no book on the manufacture of typewriter ribbon. You may however enquire of Standard Literature Co. Ltd., 13/1, Old Court House Street and W. Newman & Co. Ltd., 3 & 4, Old Court House Street; both of Calcutta.

2021 M.S.A., Mathura—In order to ascertain the percentage of tannin contained in Kikar bark you should analyse it. You may write to Industrial Research Laboratory, 22, R. G. Kar Road, Calcutta for analysis.

2022 P.W.C., Ramachandrapuram—Cigar lighters or flints are cylindrical in shape and contain a large proportion of cerium. Alloys of cerium with either 30 per cent. iron or 12 per cent. magnesium are made. Put cerium metal 88 parts with magnesium 12 parts or cerium 70 parts with iron 30 parts in a crucible and melt these by means of strong heat. Now pour these alloys to suitable moulds.

2023 F.A., Gondia—Process of manufacturing pigment finish and shoe maker's wax ink will appear in Formula Section in due course.

2024 B.L.S., Saugor—For gases enquire of Asiatic Oxygen & Acetylene Co., Ltd., 8, Dalhousie Square East, Calcutta and Indian Oxygen & Acetylene Co., Ltd., 48/1, Diamond Harbour Road, Calcutta.

2026 R.C.P., Hoshiarpur—Process of manufacturing artificial tabashir and fruit essences will appear in Formula Section in due course.

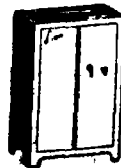
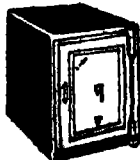
2027 K.V.N., Kamptee—For the books required you may enquire of the publishers of those books. You may consult any homeopath who may undertake treatment of the disease.

2028 A.W.A.. Lucknow—Process of manufacturing glue will appear in Formula Section in due course.

2031 R.R.B.D., Amritsar—Lime and gypsum are required for cement factories.

2033 K.P.S.G., Hindupur—A good formula of snow appeared in October 1948 issue of Industry. Ingredients may be had of Calcutta Chemical Co., Ltd., 10, Bonfield Lane, Calcutta and Allied Agency, 16, Bonfield Lane, Calcutta.

2035 D. R. B., Chaibasa—For grinding wheels and other tools enquire of Francis Klein & Co., Ltd., 1, Royal Exchange Place Calcutta and Machine Tools (India) Ltd., 3, Chittaranjan Avenue, Calcutta. Sewing machines and parts may be had of Adler & Mundlos Sewing Machines, 109A, Chittaranjan Avenue; Dutta Chowdhury & Co., 173, Dha-

ramtala Street; all of Calcutta. Optical goods may be had of Eastern Optical Co., 306, Bow Bazar Street; Bombay Optical House, 14, Bow Bazar Street and Industrial Optical Hall, 282, Bow Bazar Street; all of Calcutta.

2039 M.P., Bilaspur—Process of bleaching catechu will appear in Formula Section in due course.

2045 G.D.S., Jullundur Cantt.—Refer your query to American Trade Commissioner, 9-10, Esplanade Mansion, Calcutta.

2047 R.R.S., Jodhpur—Refer your query to High Commissioner for India, India House, Aldwych, London.

2048 P.W.C., Etawah——All the machines you require may be had of Marshall Sons & Co., Ltd., 99, Netaji Subhas Road; Alfred Herbert (India), Limited, 13-3, Strand Road; Francis Klein & Co. Ltd., 1, Royal Exchange Place and T. E. Thompson & Co., Ltd., 9, Esplanade East; all of Calcutta.

2049 S.R.S.C., Coimbatore—For particulars regarding trade with Japan you may negotiate with Commercial Counsellor, C/o. The Indian Liaison Mission, Empire House, Marunouchi, Tokyo, Japan.

2050 M.B.P., Aden—Following is a list of philatelists: Shad & Co., Lucknow; Punjab Philatelic Co., 1, Ram Krishna Road, Jullundur; B.P. Kapur, 43/3A, Suburban School Road, Calcutta and Bombay Philatelic Co., Sambaya Chamber, Sir P. Mehta Road, Bombay.

2051 S.N.K., Takee—It is not possible to manufacture hydrogenated oil without using any machines. Machine will cost you more than Rs. 2 lakhs. For machines you may enquire of Marshall Sons & Co. Ltd., 99, Netaji Subhas Road and Volkart Bros., 8, Netaji Subhas Road; both of Calcutta.

2053 M.R.S., Dum Dum—You may start manufacture of toilet goods, ink, soap, etc. We have publications on these subjects. As regards practical training you may write to the Director, Industrial Research Laboratory, 22, R. G. Kar Road, Calcutta.

2054 M. H.M., Surat—Process of manufacturing bricks and tiles will appear in Formula Section in usual course.

2056 S.D.C., Ahmedabad—Process of manufacturing polysterate powder will appear in Formula Section in due course.

2058 I.P.F.P., Delhi—You have to secure permission for publishing an all-India Directory. You better consult a physician. For securing permission you may write to Special Paper Officer, Ministry of Indistry and Supply, New Delhi.

2059 A.H., Khulna—Annual subscription of Industry is Rs. 6/- only. We have no book on candle manufacture. An article on candle manufacture appeared in May 1949 issue of Industry. Perfumes may be had of Ghose Bros., 50, Ezra Street and Paradise Perfumery House, 7, Coloototola Street; both of Calcutta. Soap stamping machines may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road and Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension; both of Calcutta. Oil refining machine may be had of Subol Dutt & Sons Ltd., 4, Clive Ghat Street, Calcutta.

2060 K.P.M., Rajshahi—There is no institution where training is given on syrup manufacture and sealing ampoules.

2061 O.P.A., Chandausi—Following is a list of cycle dealers: Bentinck Cycle Co. Ltd., 1-2, Chowringhee Road, Calcutta; Bimal Bros., 1-3, Chowringhee Road, Calcutta; British Cycle Co., Kalbadevi Road, Bombay; Phirozsha & Sons, 347, Kalbadevi Road, Bombay and Wellington Cycle & Motor Co., 313, Hornby Road, Bombay.

2065 D.T.M.W., Rajkot—All steel articles can be perfectly preserved from rust by putting line of freshly burnt lime in the drawer or case in which they are kept.

2066 M.T.C., Ajmer—We have no book on meat and vegetable preparation. You may however enquire of W. Newman & Co, Ltd., 3 & 4, Old Court House Street, Calcutta.

2067 S.N.C., Midnapore—For machines and raw materials required for plastic industry enquire of Alfred Herbert (India), Ltd., 13-3, Strand Road and Francis Klein & Co. Ltd., 1, Royal Exchange Place: both of Calcutta.

2075 T.A.G., Rewari—For gloves enquire of Adair Dutt & Co., Stephen House, 5, Dalhousie Square and Medico Scientific Stores, 30, Coloototola Street: both of Calcutta.

2076 S.S.S., Delhi—For the tape required enquire of Abdul Kayum Esufally & Bros., 193, Abdul Rehman Street and Popular Plastics, Ruby House, Opp. Colaba Tram Terminus: both of Bombay.

2077 S.P., New Delhi—D.T.T. powder is mixed with the hydraulic lime.

2078 B.C., Madras—For fountain pen engraving and printing machines enquire of John Dickinson & Co., 6, Clive Row, Calcutta.

2079 I.D.C., Mehmadabad—For selling casein you may advertise in newspapers. You may also negotiate with the following firm: Majumdar Brothers, 9, Clive Row: National Plywood Mfg. Co., 3-8, Taltala Lane and Ultadanga Plywood Factory, 2, Gurudas Dutta Garden Lane; all of Calcutta.

2082 A.V.F., New York—You may consult the following journals: Commerce, Royal Insurance Buildings, Church Gate Street, Fort,

Bombay; Financial News, Yusuf Bldg., 49, Esplanade Road. Fort, Bombay and Capital, 4, Lyons Range, Calcutta.

2086 B.N.K., Chickmagalur—For tin lid enquire of N.A.G. Tin Factory, Ghaffer Bldg., King Edward Road, Sewree, Bombay and New Fakhu Tin Factory, 97, Dongri Road, Bombay. For a list of cycle dealers see under No. 2061. Watches and their accessories may be had of Favre Leuba & Co. Ltd., Norton Bldg., 1. Old Court House Corner, Calcutta; Esoofally Hiptoola Co., 15, Radha Bazar Street, Calcutta; Meridian Watch Co., 269. Hornby Road, Bombay, and Wilson Watch Co., Empire Bldg., Hornby Road, Bombay. Wants to be put in touch with the suppliers of chicory powder.

2089 K.B.M.O.M., Palghat—If you go through our publications you will get industrial information.

2091 S.L.S.M., Guntur—For tobacco cutting machine enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta Following is a formula of chewing tobacco: Tobacco 16 ch.; cumin seed black 1 ch.; aniseed 1 ch.; coriander seed 1 ch.; musk 1-16 tola, water q.s. Remove the stalks and ribs of the tobacco and bake over a moderate fire. Then powder the leaves finely. Meanwhile bake the spices and have them also finely powdered separately. Mix the ingredients together and add the musk previously macerated in water. Then moisten with water and macerate the mass well. Next strain mass with sufficient water through a clean cloth to get a pulpy extract of the ingredients. spread the mass over a porcelain dish and dry in the sun to form a cake. Break the cake into granules or quids.

2092 S.D., Peshawar Cantt.—Reply appears in September 1949 issue of Industry.

2093 K.G.N., Ajmer—For agaragar enquire of Banshidhar Dutt, 126, Khengrapatty Street, Calcutta.

2094 S.O.M.C., Bombay—Process of manufacturing soft soap and utilizing sawdust will appear in due course.

2095 H.I., Amritsar—Industrial chemicals may be had of Calcutta Chemical Co. Ltd., 10, Bonfields Lane, Calcutta.

2096 P.C.S., Kanpur—For pad enquire of H. Mukherjee & Co., 14/2, Old China Bazar Street and International Stationery Stores, 57, Radha Bazar Street; both of Calcutta.

2097 P.R.M., Rajnandgaon—Fou may write to Reckitt & Sons, Hull, England enquiring their agent's address in India. As regards Japanese machine write to Commercial Counsellor, C/o. The Indian Liaison Mission, Empire House, Marunouchi, Tokyo.

2099 R.K.P.B., Monghyr—For baloons enquire of Mohamedally Dawoodbhoy & Co., 19, Sukeas Lane, Calcutta and Kundanmal Ramlal, Sowri Bldg., 78/80, New Hanuman Lane, Bombay 2.

2100 N.D.T., Rampur State—Following is a list of hide and skin merchants: A. Forbes & Co. Ltd., 60, Chingrihatta Road, Tangra, Calcutta; Md. Auriff Khan Bros., 31, Harinbari Lane, Calcutta; Halim Sons, Purwa Hiraman, Kanpur and Dost Mohamed & Co., Ltd., Peerbag, Kanpur. For starting a cinema house you have to invest at least Rs. 2 lakhs.

2101 R.V.S., Kurnool—We have no book on paint and varnish manufacture. You may consult Paint Technology by F. N. Heaton.

2104 H.H., Rayaguda—Yes, you may manufacture cement with the compound containing silicate and aluminate of lime.

2108 S.N.N., Gumla—It is not possible to manufacture ice in an ice cream making machine which may be had of M. S. Vernal & Co., Bharat Insurance Bldg., Central Avenue, Calcutta. Process of manufacturing cardboard slate will appear in Formula Section in due course.

2109 K.C., Sivpuri—Process of burning lime stone and refining honey will appear in Formula Section in due course.

2110 B.N., Ajmer—You may consult Industry Year Book and Directory published from this office, price Rs. 13/- including postage. We cannot supply you addresses of all the clubs of Calcutta.

2111 D.N.S., Gadag—In order to fix perfume to the soap you should manufacture neutral soap by full boiling process. Only neutral soap can hold perfume for a long time. You may use lemon grass oil 16 parts; cassia oil 16 parts and citronella oil 7 parts. This compound when used in soap will last long.

2113 R.N.D., Bahraich—For oils enquire of Adam Hajee Peermahomed Essack, 1, Amratolla Lane; Bepin Behari Tah & Co., 2, Nawab Lane and Jagadhatri Taila Bhandar, 5, Nawab Lane; all of Calcutta.

2115, S.B., Raipur—You may consult Cotton Dyeing and Printing published from this office, price Rs. 3-7 including postage. As regards Chinese process and appliances these are not available at present.

2117 G.N.S.F., Raipur—Soap cutting and stamping machines may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta. Machines for cutting sticks for agarbatties are not available. These sticks are cut with hand with the help of a knife. Betelnut cutting machines may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

2118 R.N., Poona—You should use wax soluble colour. For colour you may enquire of Champalal Agarwal, 45, Armenian Street, Calcutta. Candles manufactured with only hard paraffin will be rather soft. Starch is used in various industries such as cloth mills, jute mill, paper mill, etc.

2120 G.G.B., Dacca—Process of manufacturing stamp ink pad will appear in Formula Section in due course.

2121 I.S.C., Coimbatore—For books and magazines on sports you may enquire of W. Newman & Co Ltd., 2 & 4, Old Court House Street and Thacker Spink & Co. (1933) Ltd., 3, Esplanade East: both of Calcutta..

2124 A.S.S.L., Coimbatore—Your enquiry is unintelligible.

2126 R.C.P.S. . Hoshiarpur—Address of Mr. H. L. Halder, M.Sc., is 24, Moti Jheel Avenue, Dum Dum, 24 Parganas and address of Mr. Sukh Dyal, M.Sc. is Govt. High School, Jagadhri, Ambala. Formulas you require will appear in Formula Section in due course.

2127 A.G.M., Vaniyambadi—There is no Japanese Consal General's office in India at present.

2128 B.G.I., Bettiah—You should advertise regularly in Industry when you will get responses from bonafide buyers.

2129 S.D.K.L., Agra—Both groundnut and sweet potatoes should be dried in the sun and then ground finely in a grinding machine.

2130 K.D.W.M., Kanauj—Process of electroplating gramophone records will appear in Formula Section in due course.

2134 N.D., Delhi—We have no other book on chemical manufacture except the one already sent to you. If you are interested in perfumery line you may consult Indian Perfumes Essences and Hair Oils published from this office, price Rs. 3-7, including postage. As regards tooth powder you may try the following formula: Precipitated chalk 3 lbs.; calcined magnesia 20 oz.; salol 5 oz.; thymol ½ oz., soap powder 5 oz.; oil of peppermint 2 dr.; saccharine 5 grs. Mix the first two ingredients in fine powder. Then triturate the remaining substances with a small portion of the above mixture until quite uniform. Then mix thoroughly with the whole mixture. Following is a recipe of vermillion: Red lead 8 lb.; zinc oxide 5 lbs.; venetian red 1 lb.; vermilion dye 2 lbs. macerate these ingredients thoroughly in a stone mortar and set aside for 24 hours in a cool place. Finally pound it and pack.

2135 P., Kotah—You may consult Manufacture of Soap published from this office, price Rs. 3-7, including postage.

2136 N.C.B., Karimganj—Cream separators may be had of Edward Keventer Ltd., 11-3, Lindsay Street, Calcutta.

2138 S.L.J.C., Kandhla—For rope twisting machine enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

2139 J.S.B., Bellary—You may consult Manufacture of Confectioneries published from this office, price Rs. 3-7 including postage. For machines enquire of Small Machineries Manufacturing Co., 22, R. G. Kar Road, Calcutta.

2140 A.C.G., Najibabad—For rope making machines enquire of Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension, Calcutta.

2142 G.B., Nagpur—Process of electroplating will be found in Electroplating In Practice by M. N. Mitter published from this office, price Rs. 3-7, including postage.

2143 S.A.S., Digboi—Following is a process of making artificial wood: Sawdust 20 parts; casein 1 part; sodium silicate 9 per cent., solution 1 part. Mix all together until thoroughly homogeneous. Then press into desired shape and size and dry in air.

2144 I.S., Tarntaran—For printing machine enquire of India Machinery Co. Ltd., Dassnagar, Howrah.

2145 N.C.M., Bareilly—All the chemical you require may be had of Calcutta Chemical Co., Ltd., 10, Bonfield Lane, Calcutta.

2146 S.U.P., Pabna—Address of National Carbon Co. (India) Ltd., is 28, Pollock Street, Calcutta.

2147 P .J., Rajahmundry—We are not aware of any such University.

2148 I.P.M.C., Chirala—For selling refined salt advertise in the pages of Industry and other periodicals.

2150 D.M., Kumayun—Ordinary water soluble aniline dyes are used for painting on earthen toys. Sometimes gum solution is used along with the dyes. For dictionary enquire of Book Co., Ltd., 4-4A, Bankim Chatterjee St., Calcutta.

2152 A.C., Nigeria—Process of manufacturing matches, fireworks, etc. will appear in Formula Section in due course.

2154 K.S., Ambala Cantt.—Paper bag making machines are not available in India at present.

2155 K.P.R., Rajahmundry—For plywood cutting machine enquire of Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension, Calcutta.

2156 N.C.W., Chapra—Coconut oil may be had of Cochin Chemicals, Ayalur, Cochin; G. V. Kamath, Cochin; Adam Hajee Pirmohamed Essack, Cochin and Bhavandas Mohanlal, Cochin.

2157 R.M.S., Howrah—Process of manufacturing Kimam will be found in July 1948 issue of Industry.

2158 K.C.M., Amritsar—Process of manufacturing upper polish and shellac wax will appear in Formula Section in due course.

2160 K.I.F., Tiruthangal—Melt paraffin then soak iron filings in the melted paraffin. This will make iron filings rust-proof.

2161 S.R.S.C., Coimbatore—Address of American Consul-General is 9-10. Esplanade Mansion, Calcutta. Address of Consul General for Japan is not available.

2163 M.L.S., Canning—You may negotiate with the following cotton mills: Bengal Laxmi Cotton Mills Ltd., Mahesh, Sirampore; Mahalaxmi Cotton Mills Ltd., Palta; Pravati Textile Mills Ltd., Panihati, 24 Parganas and Sri Durga Cotton Spinning & Weaving Mills Ltd., Konnagar.

2164 S.V., Lucknow—For coloured tin plates enquire of National Sheet & Metal Works Ltd., 36A, Sahitya Parishad Street and Metal Box Co. of India Ltd., B2, Hide Road, Kidderpur; both of Calcutta.

2167 L.D.M., Delhi—You may start manufacture of inks of various sorts. For this business you may invest Rs. 500.

2169 S.R.R.S., Jowai—Picture framing accessories and glass sheets may be had of Fotic Lal Seal & Sons, 10, Swallow Lane, Calcutta: Kanay Lall Dhur, 11, Swallow Lane, Calcutta and T. C. Das, 10, Lower Chitpur Road, Calcutta.

2170 M.C.R., Comilla—Sewing thread winding machines may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta. Tablet making machines may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta.

2171 C.M.J.S., Trichur—Process of refining oil and perfuming them will be found in Indian Perfumes Essences and Hair Oils published from this office, price Rs. 3-7 including postage.

2172 S.H.B.C., Narsapur—You may treat the gut with hydrogen peroxide.

2174 M.M.S.R., Jammu—Address of Consul-General for France is Flat 26, Park Mansions, Park Street, Calcutta and address of United Kingdom Trade Commission is Harrington Street, Calcutta. Labels may be had of Bharat Laxmi Press, 92, Princess Street, Bombay 2; R. G. Paul & Co., 110-2, Grey Street, Calcutta.

2175 J.W.A.C., Trichur—For selling country drugs you should advertise in the pages of Industry.

2176 H.W., Lucknow—Process of manufacturing glue will be found in Utilisation of Common Products published from this office, price Rs. 3-7 including postage.

2177 B.C.W., Ranigunj—For gallon tins enquire of Bengal Tin Box Mfg. Co. Ltd., 1, Jadu Nath Mitter Lane, and National Sheet and Metal Works Ltd., 36A, Sahitya Parishad Street both of Calcutta. The creosote oil may be had H. Mumtaz & Co., 1, Colootola Street, Calcutta.

2178 M.M.L., Cawnpore—For glass tubes you may write to Scientific Indian Glass Co. Ltd., 6, Church Lane, Calcutta.

2179 M.B., Rawalpindi—Process of deodorising mustard oil, kerosene oil, etc. will appear in an early issue of Industry.

2180 S.F.O.M., Navsari—Particulars regarding sunflower seed oil are not available at present.

2181 K.D.C., Kanpur—Ubersee Post was published from Leipzig, Germany before the War.

2182 M.T., Bombay—Process of manufacturing dextrine from potato and starch from jawar, maize, etc. will appear in Formula Section in due course. Graphite, bauxite, shellac, etc. have demand in foreign market. You may pulverise, wheat, maize, jawar, etc. in a pulverising machine.

2184 I.N., Surat—You may refer your query to Consul-General of India in New York, 630, Fifth Avenue, New York, U.S.A.

2186 A.M.P., Ahmedabad—For making corks of wood you should use lathe machines which may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

2187 B.N.D., Cachar—You may consult Manufacture of Ink published from this office, price Rs. 3-7, including postage. For making sewing thread you should use thread ball making machines which may be had of Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension, Calcutta.

2188 P.N.G., Nagpur City—We have no book on laundry business. You may however enquire of Standard Literature Co., Ltd., 13-1, Old Court House Street, Calcutta for the book.

2191 N.R.C., Bombay—Process of manufacturing bronze powder, aluminium powder, etc. will appear in Formula Section in due course.

2193 L.L., Nigeria—We have no book on goldsmith and jewellery work. You may enquire of W. Newman & Co. Ltd., 3 & 4, Old Court House Street, Calcutta. For jeweller's tool enquire of Hamilton & Co. Ltd., 8, Old Court House Street, Calcutta.

2194 I.N.L., Talod—Compound scent is used in toilet soap. You may use the following compound: Oil of bergamot 16½ parts; Oil of geranium 6½ parts; Oil of cassia 1½ parts; Oil of sandalwood 4/5 part; Oil of cedar 3½ parts; Tincture of Musk 3½ parts; Tincture of Tonka Bean 3½ parts; Tincture of storax 10 parts. The above perfume should be used in 3300 parts of soap.

2196 K.V., Madanpalle—For making carbon paper you have to use paper, carbon black

and suet. Paper may be had of Bholanath Paper House, Kusum Smriti, 21, Beadon Street, Calcutta. Carbon black may be had of B.K. Dutt & Co., 35, Netaji Subhas Road, Calcutta.

2197 R.S.B., Bhopal—You may consult Electroplating in Practice published from this office, price Rs. 3-7, including postage. You may take up manufacture of ink with small capital.

2198 P.S.T., Kotlavalsa—H.P. of engine depends upon the number of ghanies employed. However you may write to the engine dealers enquiring about the h.p. required.

2201 J.D.J., Calcutta—You may take up manufacture of hinges, wire nails and wood screws. These have good demand in the market. You may also start manufacture of conduit pipes and expanded metal.

2202 G.G.S., Madanpalle—Wooden moulds for sweets may be had of Shakti Art Co., 355, Upper Chitpur Road, Calcutta.

2204 N.L.R.P., Dinapore Cantt.—Barley is manufactured from Indian barley.

2205 P.M.S., Colombo—A good formula of eaude-cologne will be found in February 1949 issue of Industry. As regards import of coconut and coconut oil importers of England and America enquire of Indian Trade Commissioner, India House, Aldwych, London, W.C.2 and Consul-General of India in New York, 630, Fifth Avenue, New York, U.S.A.

2206 M.C., Bombay—Laundry machine may be had of Jessop & Co., 93, Netaji Subhas Road, Calcutta. We have no book on laundry. You may enquire of W. Newman & Co. Ltd., 3 & 4, Old Court House Street, Calcutta for the book on laundry.

2209 K.H.K., Kasaragod—Gramophones, plates and accessories may be had of K.C. Dey & Sons, P31, Ganesh Avenue, Calcutta; C. C. Saha Ltd., 170, Dharamtala Street, Calcutta; N. B. Sen & Bros., 11, Esplanade East, Calcutta; and Mains Radio Gramophone Ltd., Manchester Road, Westgate, Bradford, England.

2215 P.K.G., Calcutta—For dry meat enquire of the following firms: Blue Bird Stores, 8, Bertram Street; Mazdas Ltd., 7-1, Lindsay Street and Shaw Bros. Stores Ltd., 12-13, Bertram Street; all of Calcutta.

2216 M.B., Darjeeling—Collect the hoofs of animals, soak well in milk of lime i.e. water impregnated with lime. Wash well in a stream of water to get rid of lime. Boil the material in water till the desired adhesive strength is obtained, then run liquid into a cistern to clarify with powdered alum any remnant lime and other impurities. Before cooling draw off into moulds, and cut off in slices to dry in the air.

2218 K.N.M., Saugor—For oil engines enquire of the following firms: Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road; Francis Klein & Co., Ltd., 1, Royal Exchange Place and Alfred Herbert (India), Ltd., 13-3, Strand Road; all of Calcutta.

2219 V.N., Shencottah—Vide No. 2216 above.

2220 H.S.M.C., Gulbarga—Process of manufacturing iodine will appear in Formula Section in due course.

2221 P.T.J., Cochin—Reply has already been sent by post.

2223 G.C., Ludhiana—You may consult Cotton Dyeing and Printing published from this office, price Rs. 3-7 including postage.

2224 B.B.N., Junagadh—A formula of agarbatti appeared in November 1948 issue of Industry under the caption of incense sticks.

2226 R.K.S., Fatehpur—For cotton printing and other textile machine enquire of W. H. Brady & Co. Ltd., Mercantile Bldg., Lall Bazar, Calcutta.

2227 P.S.C., Kotah—Pill making machine may be had of Prabartak Commercial Corporation Ltd., 61, Bowbazar Street, Calcutta.

2229 G.P., Jaipur City—You may use rosin along with wax for making toys.

2230 K.L.D., Bombay—It is not possible to anodise aluminium without electric power and to plate imitation gold without electric power.

2231 K.C.N., Kanpur—For paper cutting, binding and ruling machine enquire of the following firms: Oriental Machinery Suplying Agency Ltd., P-12, Mission Row Extension; Printing and Industrial Machinery Ltd., Windsor House, P-14, Bentinck Street and John Dickinson & Co., 6, Clive Row; all of Calcutta.

2232 G.S.C., Kanpur—For securing licence you may write to Controller of Imports, New Delhi. Vide No. 2205.

2233 R.V.S.C., Kurnool—Following is a formula of French polish: Shellac 30 parts; gum copal 15 parts; gum arabic 7 parts; methylated spirit 700 parts; vermilion 5 parts. First of all pulverise the shellac, copal and gum arabic and then put into the spirit. Keep aside for 4 or 5 days stirring once a day. When dissolved strain through a cloth and keep in a well stoppered bottle. For bottles enquire of the following firms: Ananta Kumar Ghose & Co., 9, Ezra Street and Bimal Bottle Stores, 130, Radha Bazar Street; both of Calcutta.

2235 D.D.S., Simla—For raw rubber required for rubber stamp manufacture enquire of B. Goray & Co., 156, Cornwallis Street, Calcutta 6. Other raw materials required may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta.

2236 F.C., Modinagar—Raw rubber may be had of Traders India (Travancore), Post Box No. 33, Kottayam, Travancore and Pallivathuckal Estates, Negapatam, Kottavam. For benzene and naphtha write to Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta.

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2238 I.N.U., Surat—You may consult The Newspaper Press Directory published by C. Mitchell & Co., Ltd., Mitchell House, 1 & 2, Snow Hill, Holborn, Viaduct, London E.C.1.

2242 M.N.A., Karachi—Process of washing, dyeing and bleaching wool will appear in Formula Section in usual course.

—REVIEW OF BOOKS

INDUSTRIAL PROFITS IN INDIA by M. C. Munshi. Published by the Research Department, Federation of Indian Chambers of Commerce and Industry, New Delhi. Pages 328, price Rs. 15/-.

The book is an inductive study of the profit trends of the principal Indian industries between the years 1936-44. The industries included in the study are: the cotton textile industry, the sugar industry, the iron and steel industry, the paper mill industry, the cement industry, the jute mill industry, and the Indian Coal Mining industry. The book is packed with statistical details and graphical representation of the profit trends. It will be of ample help to students, research workers, economists and industrialists in assessing the extent of financial progress of our principal industries and whatever drawbacks there be that may retard it.

Analysis of profit trends is important from the investor's point of view as an indicator of business activity. It is an aid to the framing of business policy. A reliable index of business profits helps the tax-administrator do his work in a more scientific manner. Profit trends not only indicate business activity, but may be utilized for the framing of "a price policy or business policy which aims at ironing out the movements of the trade cycle." In estimating the profit trends aright, the author emphasizes, official as well as non-official authorities supplement each other's efforts. Part of the requisite information can be culled from official publications, such as the profits index prepared by the Economic Advisor's Office, and part from non-official publications like the balance sheets and progress reports issued by the Joint Stock Companies.

The work under review is probably a pioneer attempt of its kind in this country. From an analysis of the profit trends it reaches the following conclusion with regard to the recent progress in the industrial field:—

"Our broad findings would easily show that the high ranges in net profits are to be found in (1) Cotton, (2) Paper, (3) Jute and these industries are followed by Sugar and Iron and Steel. In contrast with jute, the coal industry could benefit little out of the war boom, except towards the end of the period (1936-44), although the war came at a stage when the industry had turned a corner. Thus, while the former probably made the most out of the war, the coal mines, largely because of transport difficulties and internal weakness, failed to profit by the opportunities afforded to them"

HOW TO DRAW TECHNICAL ILLUSTRATIONS by Linsley and Hawkins. Published by The Studio, Ltd., 66, Chandos Place, London W.C.2. Pages, 64, price 3sh. net.

Technical illustrators are much in demand these days. All who can draw may profitably turn to the job of technical illustrating not merely to explain visually the make-up or working of a piece of engineering but also for the purpose of advertising effectively the various engineering products. The value of this short brochure on technical illustration as a practical guide to the intending pupils is quite appreciable. Both technicians and commercial artists will find it well worth reading.

BENGAL IN MAPS by S. P. Chatterjee, M.Sc., Ph.D., (London), D. Litt., (Paris). Published by Orient Longmans, Ltd., 17, Chittaranjan Avenue, Calcutta. Price, Rs. 18-0.

The book under review is a pioneer attempt of its kind in India, being a geographical analysis of resource distribution in West Bengal and Eastern Pakistan. In his Foreword to the work Dr. S. P. Mukerjee, India's Minister for Industry and Supply, emphasizes its importance specially in relation to national planning and reconstruction, an immediate necessity to help India on to her feet by co-ordinating freedom's political and economic aspects. He also refers to the tremendous interest shown by the Russian Government in the compilation of maps such as Dr. Chatterjee has made in the work under notice.

This compilation is not of the conventional kind. A glance at it amply bears out the author's claim that it is a product of field and library work spread over a number of years. Altogether the work contains 80 maps dealing with various aspects of Bengal's geography: physical features, climate, population, occupations of its inhabitants, Agriculture, Industry, Transport, Education and Health. Agriculture covers a major portion of the work and the relevant maps show the distribution of all the province's major crops, both food and cash. The maps dealing with the industries cover both cottage and manufacturing industries and the principal industrial regions are separately shown. The usefulness of a publication of this kind cannot be overemphasized and we would echo Dr. Mookerjee's desire that efforts that Dr. Chatterjee has put forth in it may receive support and encouragement at the hands of the state. We wish other scholars were put on the job of compiling maps of other regions in India. Such a job is no doubt a painstaking one, but it is worth one's while to face up to it.

MR. GANDHI. THE MAN by Millie Graham Polak. Published by Vora & Co., 3, Round Building, Bombay 20. Pages 146, price Rs. 3/-.

At a time when literature is growing fast and thick around Gandhiji's life and teachings, a re-print of this older publication will be valued as a product of the authoress's direct contact with that great personality during his South-African sojourn. Mrs. Polak wields a very facile pen and she very well succeeds in spinning an eminently readable story

out of her reminiscenes of the Mahatma's early days abroad. Her main aim is to reveal the man and not the politician in Gandhi. The book shows Gandhi moving about in the midst of the common mass of mankind, taking a deep interest in a lot of things besides politics. It shows him as a non-violent fighter against man's iniquities to man. The Passive Resistance movement is no doubt a very important episode of his life and the authoress succeeds in bringing the central figure in it into a bold relief even without concentrating on its controversial political aspects. Mr. and Mrs. Polak, it should be noted, were the Mahatma's fellow-workers in South Africa and this, more than anything else, is the main inspiration behind the present work and its charming human interest. Mrs. Polak's treatment is a refreshing departure from the tedious panegyrization of Gandhiji so abundantly in vogue. She is not naively uncritical as some of our Gandhi-philes are. Rev. C. F. Andrews who writes a Foreword to the present edition of the book rightly says of the authoress, "Though an idealist herself, she seeks by rare common sense and penetrating insight to test his (Gandhiji's) theories and check what she regards as extravagances. In this may, she clears aside all kinds of fantastic notions about him and reveals him as the most tender soul in all the world and humble in spirit as a little child."

TOWARDS A DYNAMIC ECONOMICS by R. F. Harrod. Published by MacMillan & Co., Ltd., London. Pages, 169, price, 7-s. 6-d, net

The book contains five lectures delivered at the University of London in the spring of 1947. As is the traditional fashion followed in such works, the discussion is keyed up to a very high academic level not accessible to the common reader. And yet there is little doubt that the nature of problems discussed in the treatise is such as the average humanity ought to take some interest in. The need thus is for a book that can boil down difficult subjects making them intelligible to men of average education. Mr. Harrod's book discusses in the high-browish professional style some recent theories and their application to policy. However, the interest of the book is not altogether academic. Mr. Harrod discusses some of the practical problems of contemporary economy like the trade cycle, full employment, and foreign trade. On the whole, he is not opposed to retaining the capitalist system of economy. He does not rule out the possibility that in future interest may cease to be an integral part of economy, and he believes that with the elimination of this particular feature of capitalism there will be less and less objection to the continuance of free enterprise and profit-making. In his Foreward to the book, written in the beginning of 1948 the author says that "the idea underlying these tectures is that sooner or later we shall be faced once more with the problem of stagnation, and that it is to this problem that economists should devote their main attention". As all are aware, depression is coming on all too fast and even in the most prosperous country like the U.S.A. business recession is reported to have set in.

NOTICES & REVIEWS

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ERASER.

We have the pleasure to receive from Richard Pieris & Co. Ltd., Post Box No. 144, Colombo, ten pieces of rubber eraser of good quality. We wish the concern every success.

CURRY POWDER.

We have received a sample packet of curry powder from Kantam Stores, Arambadi, Nimpura, Khargpur, B.N. Ry. The preparation is found to be satisfactory.

MANGO PICKLES, LIME PICKLES, ETC.

We are glad to receive from B. Bros. (Regd.), G. T. Road, Yellamanchili, Dist. Vizag., S. India a few sample packets of several varieties of mango pickles, lime pickle, mango chutney, etc., which are found to be good and tasteful.

TABLE SALT.

We are glad to receive from Industrial Products Marketing Coy., Chirala, Siuth India, one sample tin of table salt manufactured by them. We have examined the sample and found to be small grained white salt free from moisture.

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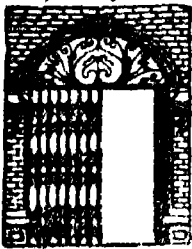
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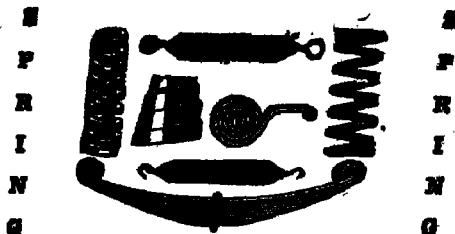
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ONTHLY MAGAZINE FOR MANUFACTURERS & BUSINESSMEN

XL. CALCUTTA, NOVEMBER, 1949. N

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Sweet Chewing Cigarettes, Eucalyptus Oil, Honey, Scented Supari etc., PPCo., 43, Varadamuthiappan St., Madras. 273 AA

Wanted Agents for all kinds of Buttons and Tailoring Materials. Industrial Distributors D-5/89, Tibbia College New Delhi. 482 AA

Agents for Silk Chaddars. No security. Ask Particulars: Girson Knitting Works, Ludhiana. 893 AA

Dry Colours & Oil Paints: Wanted Agents everywhere: Indian Chemical & Colour Works, 66, Simla Street, Calcutta 6. 907 AA

For our "Rhino" Brand Tanned Leathers. Wanted Agents. East India Trading Company, Post Box 487, Calcutta. 915 AA

D. D. Malam—A Soothing Ointment for all Skin Diseases, never stains on clothes. Wanted Agents, Mahatma & Co., Jorasanko, Calcutta 7. 914 AA

Wanted agents pay rupees 250, daily allowance Rs. 5, and on commission for Goldlite fountainpens. Goldlite Regency, 577, Sadarbazar, Delhi. 901 AA

Wanted Agents to Earn 500/- Monthly working for Embossers, Nameplates. Locks & Pinning machines Apply International Industries Ltd., Aligarh. 765 AA

For "Organisers and Agents" on suitable terms, apply Oriental Provident Insurance Ltd. 23, Canning Street, Calcutta. Phone Cal. 7175. 779 AA

AGENTS WANTED.

Bangaluxmi Leather Works, 10/B, St. James Square, Calcutta—Wanted Stockists for money Purses & Ladies Hand Bags. 754 AA

"Penguin" Solid Stencil Ink. Wanted Agents. Apply Senco, 49, Sastitala Road, Calcutta—11. 678 AA

Baby Malam—a Stainless analgesic ointment for all skin diseases; Madhab Balm—a Pain Balm. Wanted Agents. Madhav & Co., Jorasanko, Calcutta. 759 AA

Wanted Capable Agents for our Stomach Pills—Best Laxo-Purgative. Prospectus Most Attractive New Oriental's Pharmaceuticals, 47, Nakhoda St., Bombay 3. 278 AA

Wanted Agents pay Rs. 200 allowance daily Rs. 5 and on commission for foreign goods, Lalit Import Service, Sadarbazar, Delhi. 996 AA

Agents Wanted for Raisons and Gordons various products. Inks, Pastes, Sealing and bottle capsule waxes etc. Apply:—D. H'Rai & Co., Match Factory Lane, Kurla, Bombay. 855 AA

Salary Rs. 95/- plus commission to suitable representatives. Apply Valley Tea Corporation, 37 Durga Charan Doctor Road, Calcutta—14. 995 AA

Wanted Travelling Canvassing Agents & Customers on Liberal Commission Basis, for Bhavani Carpets & Carpet Bags. Apply to:—The Ganesh Industrials Carpet Manufacturers, Bhavani, P.O. Via Erode, S. India. 945 AA

Wanted Agents in each city to sell our washing soaps, terms very liberal, apply to the managing director, Saraswati Vegetable Oil Mills Ltd., 428, Kalbadevi Road, Bombay. 774 AA

Wanted District Agents for Madras, U.P. and Central India on decent Commission for sale and Propaganda of reputed Medicines. Write stating particulars. Pearl Chemical Industries Ltd., Calcutta—37. 891 AA

Wanted Agents to canvass orders for our cotton carpets & hand bags on attractive terms. Liberal commission awarded. For details apply to Sengunthа, Carpet Emporium, Carpets & Handbags Manufacturers, Bhavani, Via Erode, S. I. Ry. 954 AA

R. C. Chemical Works, 150/1B, Amherst Street, Calcutta, Factory — 128/1, Bowbazar Street, Calcutta. Manufacturers of: Phenyle, Soft soap, Monopoly soap, Liquid soap & Carbolic Liquid Soap. Wanted Stockists & Agents 1065 AA

Wanted:—Wholesale Dealers for our own make first class "Mullick" Brand Rotary Treadle Sewing Mechinees. Thousands are already in actual use with reputation. K. C. Mullick & Sons, Ltd., 77-18, Dharamtalla St., Calcutta. 775 AA

Sree Saradha Industrials, High Class Carpet Manufacturers, Bhavani. Via Erode S. I. Ry. Invites orders from wholesale dealers and undertakes supply of cotton carpets, hand bags and art silk carpets at competitive rates. Agencies offered for unrepresented areas. 953 AA

AGENTS WANTED.

Wanted Agents for Indo-Ceylon to earn 500/- monthly. Loomba General Stores, Ludhiana. 974 AA

Buckingham Color Company, Indore, Want Agents for Paints, Dry colours, Varnish paints white paints apply. 548 AA

Wanted order securer for printing, poster, Box, cartoons. Whitemans Traders, 17/4, Harrison Rd., Cal. 1071 AA

Wanted agents to secure orders for hand-loom piecegoods. Swarajya Handloom Works, Chovva Post, (Malabar). 1058 AA

For sports, science apparatus goods. Chawla Corporation, 447, British Infantary Bazar, Ambala. 1081 AA

Wanted wholesale and retail customers for shawls, scarfs, lotus-honey, saffron, etc. Rates most attractive. Write to Kashmir Products House, Srinagar-Kashmir. 983 AA

Wanted Agents for stationery articles, Apply with 12 As. stamps or by P.O. for samples, etc. Komet Merchandising Corporation, 4548, Ratan Pole Ahmedabad. 1003 AA

Wanted Agents or Sole Distributors for U.P., C.P., Madhyabharat & Sourastra Provinces for our medicinal products. Adeco Ltd., Calcutta 27. 786 AA

Earn Rs. 15/- or more daily with Rs. 15/- only, refundable. For particulars and agency terms contact. K N Kumar & Bros., 6/1, Gurdwara Road, Karol Bagh, Delhi. 696 AA

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"Bichitra" Rang Sabun, carbolic soap 5%, "Suvra" washing soap, Bar soap & "Sree Durga" Balls. Wanted agents. Sree Durga Chemical Works, Parimal Kutir, Bonpas Town, P.O. Baidyanath, Deoghar (Bihar). E. I. Ry. 1082 AA

Wanted Agents and Merchants to sell fast coloured silk saree of 46 ins. by 6 yds. Rs. 10-8 for one. V.P.P. charge free. S. K. Ramaswamy, Weaving Factory, Kottar, S. Travancore. 886 AA

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St. Ford's Bankink (Extra fine record Ink), Stickal (Country Gloy), Travel Gum (2 oz. & 4 oz. Fancy Phials with rubber capsules), Fountain pen Ink, Paragon Writing Ink & Inkit (ink powder), and famous Royal Elephant Brand White Glazed Twine Balls. Wanted Agents. Chemproducts (India), Limited, 12, Tanner Lane, Calcutta. 665 AA

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San-Tosh & Co., 13, David Joseph Lane, Calcutta—1, Coloured & White Bottles, Phials, Cork Products, Cellulose Capsules, Bakelite, Metal & Aluminium Caps, Sandal Oil & Essential Oils etc. Phone: West 1091. Telegram: 'Santexko'. 867 BC

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Correction—The address of M/s. Paul's Engineering Co., printed wrongly in our issue of Oct./49. The correct address is "207, Belilious Road, Howrah." 1039 MA

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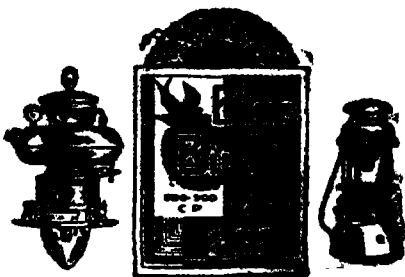
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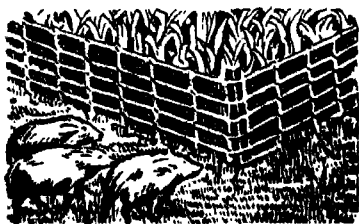
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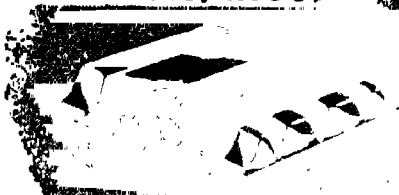
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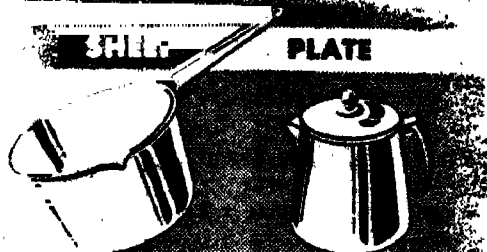
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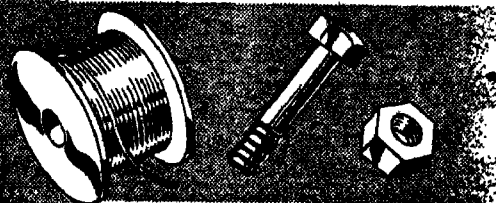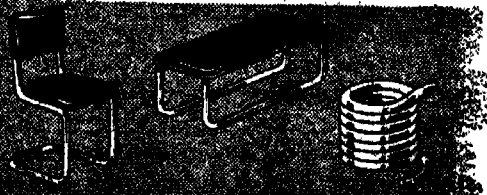
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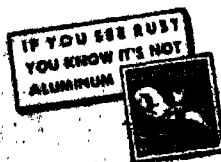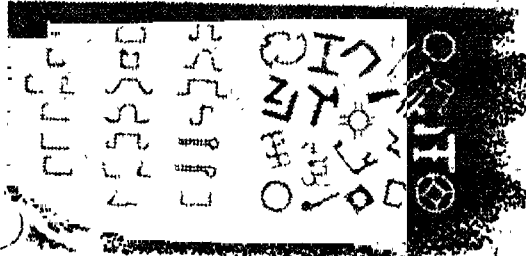
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EDITOR:
K. N. BANERJEE.

VOL. XL. CALCUTTA, NOVEMBER, 1949. No. 476.

DEVALUATION OF THE POUND AND THE RUPEE

DESPITE persistent previous assurances to the contrary Britain was forced to devalue the pound sterling in relation to the dollar. Following the British decision which came upon the entire world as a major surprise move in recent history India and other countries of the sterling area announced their decision to reduce the dollar value of their respective currencies either simultaneously or shortly afterwards. Pakistan alone refused to toe the line, her decision not to devalue her Rupee creating some considerable bewilderment in the Indian Dominion.

Britain's reduction of the dollar value of the pound by nearly 30.5 per cent may appear somewhat drastic. But even though Britain acted of her own accord and without any kind of pressure from the U. S. A., it can be hardly denied that devaluation was decided upon under the compelling necessity of closing the dollar gap.

In July this year the United Kingdom had taken the decision to cut down its imports from the dollar area. The London Conference of the Commonwealth Finance Ministers recommended similar cuts in dollar imports for the participating countries. In view of the dwindling reserves of gold and dollars held by the countries of the sterling bloc, this was considered as a timely measure to conserve dollars.

But at the same time it was admitted on all hands that the cuts were no more than a negative measure. All felt that the only effective way towards preventing further shrinkage of dollar reserves lay in and through adding to the reserves by earning more dollars. And that meant that the entire sterling bloc would have to boost up its trade with the dollar area. The recent tripartite conference at Washington decided upon a 10-point programme with the object of bridging the dollar gap of the sterling area. But from a perusal of this programme alone it could be hardly followed how exactly Britain and her other partners of the sterling bloc might succeed in earning more dollars as long as their goods were in no position to command economic prices, such as might make them acceptable to the dollar area. Devaluation, it is now clear, provides the resolution of what had appeared as a mystery previously.

Obviously, devaluation is an expedient to reduce the dollar value of exports from the sterling area. This provides the basis of Sir Stafford's expectation that as a result of devaluation of the pound Britain's exports to the dollar area will receive a fillip.

All the same it cannot be guaranteed with any amount of certainty that devaluation is bound to provide the big incentive to British exports to the U. S. A. which Sir Stafford had promised in Washington. The U. S. Government is no doubt very sympathetic to Britain in her efforts to liquidate the dollar crisis. But the same can hardly be said of American business magnates some of whom are openly skeptical of Britain's experiments with Socialism.

Moreover Britain is a manufacturing country and the manufactures she can send out to the U. S. A. are available in plenty within the dollar area. It is, however, hoped that devaluation will bring down the prices of British goods in terms of dollars and thus help to create a market for these in the dollar area.

The Government of India's decision to devalue the rupee in relation to the dollar to the same extent as the British pound, has been taken despite the fact that the rupee is not linked with sterling nor is India an exporter of manufactured articles as Britain is.

As a result of devaluation our exports to the dollar area are expected to receive a fillip upwards. But at the same time the dollar value of our goods having been reduced by 30 per cent, we will have to export more goods to maintain our " status quo in dollar earnings." Also, in order that the dollar area may prefer to buy more goods from this country, we shall have to take measures to improve the quality of our articles of export.

One of the risks that arise from the devaluation of the rupee is that the portion of the sterling balances convertible into non-devalued currency will diminish in value. Also, if the prices of British goods go up as a result of devaluation, our sterling balances will depreciate in terms of these and this means that we shall receive less of British goods against our sterling balances than in the period before devaluation.

How exactly devaluation may affect our internal economy is not immediately foreseeable. The Government have come out with the welcome assurance that all necessary measures will be taken to prevent internal price rises. Imports from the dollar area will be reduced considerably and these will be replaced, wherever necessary, by imports from the sterling area.

There is no doubt that Pakistan's non-devaluation decision will affect our export programme as well as internal production to a perceptible extent. As we may have to pay more for raw jute from Pakistan the cost of production of our jute industry will rise and this will diminish our capacity to compete in foreign markets in this commodity. India, it is reassuring to note, is now seriously considering how best she can counteract the disadvantages due to Pakistan's refusal to devalue the rupee.

ƳORLD'S OIL RESOURCES

Speaking at the U.N. Scientific Con-erence on the Conservation and Utiliza-ion of Resources at Lake Success a few veeks ago Prof. A. I. Levorsen of Stans-ord University said that although the vorld's known oil reserves amounted to 0,000m barrels (enough to last only 20 ears at the present rate of consumption) -there were vast undiscovered deposits 00 times the present annual consumption. According to the professor, "the present nown oil reserves are divided equally etween the eastern, and western hemis-heres. Of the undiscovered reserves, vo-thirds are to be found under water n the *Continental Shelves*—the land ad-joining the continents and sloping down a depth of 600 feet below sea level—nd one-third in land areas. Recent dis-overies of oil deposits in the *Continental helf* in the Gulf of Mexico, off the coast f Texas and Lousiana have called atten-on to this vast potential source of iture discoveries."

LASTIC INDUSTRY

The Indian Plastics Delegation who isited Britain and the U.S.A. last Sep-mber to make an on-the-spot study of e developments in this branch of indus-y in the two countries concerned, have cently submitted a report of which the arious suggestions and recommendations eserve a close consideration by those who e interested in properly expanding our wn plastic industry.

The biggest handicap confronting the dustry at the present moment is the aucity of chemicals and raw materials. or equipment and raw materials this ewly started Indian industry is exclu-vely dependant on foreign countries. he Indian Plastics Delegation suggests at it would be desirable to help the industry expand by permitting imports of equipment and raw materials and by development of markets for the different types of articles. With regard to the moulds the report says that it is possible to manufacture these in India if the requisite technical assistance be available from foreign countries. In this connexion the report goes on to say that foreign firms are willing to start joint enterprises with Indian businessmen for turning out moulds in this country.

In their report the Indian Plastics Delegation points out that it is necessary to establish a central factory in India for the production of raw materials including polystyrene. In order to establish such a factory moulders should be ready to invest sufficient capital in the industry. The Government can encourage the investment of such capital by guaranteeing a minimum return on it for the first few years. The Government, the report continues, can be of considerable help towards the expansion of this country's plastic industry by permitting the importation of raw materials without charging any duty thereon and also by helping to procure the raw materials.

RAILWAY WORKING WELL

Reviewing the railway situation to-day in the course of a recent speech at Nagpur the Minister of State for Railways and Transport expressed the hope that very soon the evil known as the transport bottle-neck would end completely. Already the free movement of goods by train has been restored and, as a result of this improvement the priority system is being eliminated section by section. The Minister also referred to the Government's schemes for reconstruction of the railways. The loan, recently obtained from the

World Bank, of 34m dollars will be of considerable help to us in securing from abroad equipment and technical assistance necessary for the purpose. In certain quarters there is now audible a demand for the reduction of railway freights. The Railway Minister described it as ridiculous that anybody could ask for a reduction of freights in the face of the fact that while the freights had gone up by 10 to 50 per cent, goods and commodities had increased in value by 300 to 400 per cent.

CARDAMOM INDUSTRY

In a note on the "Cardamom Industry" by Mr. M. C. Satyanarayana reprinted from the *Indian Journal of Economics*, there are certain interesting details on the production and marketing of his valuable earner of foreign exchange. The cardamom plant is grown in Ceylon and South India. In India the industry is localised in Madura, Tinnevelly, Coimbatore, Malabar, Cochin, Coorg, Mysore and the North Canara district of the Bombay Province. The annual output of cardamom in India is normally about 7,000 Cwts., but in the past 12 years it has varied between 18,000 and 51,000 Cwts. per year. For domestic consumption India's annual requirement does not exceed 13,000 to 15,000 Cwts. The rest, along with the imports from Ceylon, are exported. The exports amounting to nearly one-third of the total production are valued at about Rs. 20 lakhs annually.

Mr. Satyanarayana in his Note under reference says that the primary producers of cardamom have not benefited even when the prices of the commodity are increasing. It is the middlemen who by virtue of their financial resources enjoy the profits of the trade almost exclusively. Back in 1946 it was suggested that an All-India Cardamom Board on the lines of the Indian Coffee Board should be set up for providing proper marketing facilities to this indigenous South Indian industry. But ever since no effort has been made to realize this objective. Cardamom occupies an enviable position in India's export trade and it is free from competition from outside. Its marketing facilities, therefore, ought to be developed in our own interest. If the cardamom industry is considered unable to bear the expenses of the proposed Board, it may be advantageously decided to set up a combined Board for cardamom and coffee or other spices.

POWER PLANTS FROM JAPAN

Under the U.S. auspices Japan is now fast rebuilding her industries. Current reports indicate that her power generation machinery industry has now been reconstructed and restored to its pre-war level. It is said that the progress made in recent months is so very satisfactory that Japan is now in a position to export power plants manufactured in the island, to foreign countries.

India has in hand a number of multipurpose projects on the successful implementation of which depends to a very large extent the economic development of the country. For this purpose we need electrical machinery and capital goods part of which at least can be obtained from Japan. The Japanese power plants are said to be cheaper in price than those the Scandinavian countries can supply. Also, imports upto certain limits from Japan will not have to be paid for in dollars. Whether, of course, the quality of the Japanese machines is suitable or not should be ascertained with care with the help of technical experts before we decide to import these for our use. It will not be out of place, however, to point out in this connexion that in the pre-war days Japan had succeeded in earning a good name for the efficiency of her power plant industry.

"SHELL X-100"

The Burmah-Shell came out with an advertisement recently in the course of which the Company claimed that it had succeeded in manufacturing a special oil —"Shell X-100" which would remove the basic cause of engine wear which is not due so much to mechanical friction as to "the corrosive action of certain combustion gases and moisture, which, under certain conditions, condense on the cylinder walls." The manufacturers describe the efficacy of their new oil in the following words:—

"Shell X-100 is a highly refined mineral oil incorporating additives—chemical substances which reinforce the lubricating properties of the oil and give it entirely new ones. The result is an oil with these special qualities:—(1) It cleans the engine and keeps it clean; (2) It is exceptionally resistant to the high temperatures and pressures of modern engines; (3) It gives freedom from sludging troubles; and (4) It protects the engine at all times, whether running at low temperatures or at high or at rest in the garage."

THE BONEMEAL INDUSTRY

Efforts are now being made to place the Indian bonemeal industry on a stable footing. Last August the Central Ministry of Agriculture convened a Conference of the representatives of the trade, collectors of raw bones, and officials to discuss what measures should be taken to achieve this object.

The Conference had at its disposal a very short time on account of which it could not go into details regarding the rehabilitation of the industry. And yet it must be admitted that it has succeeded in laying the foundation for scientific study of the bonemeal industry for the first time in this country. The bonemeal has an important use as manure and also in the manufacture of glue and gelatine.

The Conference held the view that in fixing the price of bonemeal both cost of production and the ability of the consumer to pay it should be taken into account. The export of crushed bones need not be stopped until the glue and gelatine industries are set up in India. The bonemeal, the Conference wanted all to note, was a valuable foreign exchange earner. It was suggested by the Conference that there was the necessity for an efficient organization to collect and use bones both for industrial purposes and for improving the fertility of the soil by the use of bonemeal as manure. The Conference also recommended the use of sterilised bonemeal as cattlefeed in view of its nutritive value.

LOAN FROM WORLD BANK

Some time ago, the World Bank granted a loan of 34m dollars to India for the reconstruction and development of her railways. This has been followed by the grant of another loan of 10m dollars to finance partially India's schemes to improve agricultural production. It has been announced that the loan is for a seven-year term and carries an interest rate of 2½% plus commission at the rate of 1% which is allocated to the Bank's special reserve fund.

India at the present moment has set herself the goal of attaining self-sufficiency in food by the end of 1951 and for this purpose she will have to import agricultural machinery from abroad for the reclamation of weed-infested land. The total capital outlay for the reclamation of 3m acres of weed-infested land in Central India and subsequent cultivation to produce about 4m tons of foodgrains would amount to about 2.5m

dollars. India will finance the major portion of this out of her rupee and sterling resources. The loan from the World Bank will be utilized in financing purchases of tractors and other equipment from the U.S.A. In northern India about 100,000 acres of jungle will be cleared for the purpose of cultivation of foodgrains. Negotiations for another loan from the World Bank are now being carried on and this is meant to finance the project for power generation at Bokaro in the Damodar River Valley.

AUSTRALIA'S OFFER

India is suffering from a shortage of dollars and this means she will have to depend on the sterling area countries for supply of those needs that were formerly bought with dollars. Writing in a recent issue, *Austral News* says that Australia can supply some of these needs. "Particularly with regard to machines and machine tools," says this publication of the Australian Trade Information Service, "Australia is in a position to help India in her progress towards more complete industrialisation."

What are the varieties of machines and machine tools Australia can now export to India? Replying to this question *Austral News* says, "The list is too long —Self-centering lathe chucks, drill-chucks, tension wrenches, roller feed saw benches, grinding wheels, circular knives, spray finishing equipment, pipe wrenches, oil-burners, reamers." It states further that Australian manufacturers are offering power hacksaws, lathes, lifting gear, chain blocks, hand blower forges, cramp folders, power presses, shaping machines, surface grinders, pipe bending machines and anvils. Machinery items offered for export from Australia include boring plants, food processing plants, concrete mixers, retreading machine, diamond drilling equipment, tin dredging machinery, and log haulers.

—MANUFACTURE OF CUTLERY—II

By V. L. N. Row, B.Sc. (Engg.), A.M.I.E. (Ind.), Assoc. Amer, I.E.E.
Formerly of the Indian Cutlery Manufacturing Co., Ltd., Calcutta.

POLISHING

THE method of polishing adopted for Spoons and Forks is in no way different from the usual methods of polishing adopted for other articles. The polishing medium is usually trent-sand with blue oil. The stails, prongs, and back bowls are polished on bull-neck covered wood bobs dressed with melted resin. The article is usually held in the hand and presented to the bob in a series of short strokes, while the polisher gathers sand in the right hand and this is allowed to fall between the article and the bob. The average speed for a 12" dia. bob is about 1450 to 1500 (the normal speed of an induction motor facilitating direct drive). It is usual to work across the article in the first operation is known as "roughing". This is followed by a "cleaning off" operation in which the polishing marks from the roughing operation are obliterated giving a uniform direction of flow; the insides of the prongs of the forks are polished on stringing out bobs, 12" dia. made from selected butt-leather, turned to a thickness of about 3/32" and run at the same speed as the roughing bobs. The inside of the bowl of a spoon is polished on small bobs of butt leather, again using trent-sand. Care must be taken not to overheat the spoon, otherwise the bowl may crack. This operation on high class work is usually followed by bobbing out the inside of the bowl. Using felt bobs with finely sieved Sheffield-Lime damped with Seal oil, which gives a very high colour to the spoon. All the above operations are highly skilled, but the great advantage of this method is that when correctly done, the spoon or fork can be directly silver-plated provided a reasonably heavy deposit is required.

The modern tendency seems to be towards emery bobbing instead of sanding with skilled or unskilled labour, although this change in accepted methods is only resulting in poorer finishes. It is of course necessary that an emery bobbed article shall be well "grease-mopped" as owing to the very high standard of finish demanded of tableware, it is essential that no polishing marks shall remain when the article is sold. The grease-mobbing operation uses stitched section mops of 12" or 10" dia. and Tripoli Compo run at about 2800/2900 R.P.M., while the insides of bowls are mopped on hard open calico mops of from 2½ to 3½" dia. This is followed by a colouring off process using 10" dia. open mops of hard calico with a white finish whose abrasive is finely powdered lime having a high percentage of magnesia. Care should be taken to leave the article clean, particularly along the edges.

This last point is of greatest importance, as if polishing campo is allowed to set hard, it usually requires a mechanical operation to remove it, since the usual plating shop cleaning cycle, while quite successful in dissolving the grease of the campo generally fails to remove the polishing dirt, particularly in the roots of fork prongs. Before the articles leave the polishing shop it is most imperative to make a very careful inspection since at this stage it is possible for the first time to see any imperfections which would mar the final appearance of the plated article.

PLATING PROCESSES

Silver is the most popular finish for table ware and there is really no doubt that it is the best from considerations of appearance and resistance to wear. Its only disadvantage is its liability to rapid ternishing, particularly in the presence of sulphur tainted atmosphere. It is of course very soft and can be easily finished to a very high lustre. When deposited under carefully controlled conditions the adhesion obtained is almost perfect as it will withstand considerable deformation and abrasion without stripping.

USUAL SPECIFICATIONS

The tableware electroplating is usually specified in pennyweights per dozen articles 1 dwt. being 24 grains (or 1/20th tro oz.). This being the English method of specification the American way is to specify as 1 oz. per sq. ft. giving an average thickness of 0.00125, while a cheaper grade is specified as 0.48 oz. per sq ft. giving an average thickness of 0.0006." In any case the minimum thickness is usually never less than 0.0018." Uptodate the Govt. of India have not yet standardized any measure of specification for the electrolyting of tableware and it is high time that the newly formed Indian Standards Institute devotes some attention to this subject. The following table however gives some idea of the American & British Specifications on the subject :

SPECIFICATIONS FOR ELECTROPLATING TABLEWARE

AMERICAN.

	In dwts. per dozen articles.
Table Spoons & Forks	34
Desert Spoons & Forks	25
Teaspoons	15

BRITISH.

Hotel & Ship	A_1	A_2	B	C
Use 40	34	24	16	8
28	26	20	12	6
15	12	8	6	4

While the process of electroplating is being contemplated one should bear in mind that the above are finished weights so that it would be necessary to increase the actual weight of the deposit to cover finishing losses, for which usually about 10% is allowed.

ELECTROPLATING PLANT

In the manufacture of tableware most of the silver plating plants used are manually operated, because the fully automatic type is not very much suited to this industry, since the variation allowed is anything between from 0.002 to 0.0004". The peculiar requirement of this plating is a wooden frame carrying the cathode rods, which is moved forwards and backwards a distance of about 3/4" each side of centre across the top of the vat, to ensure a smoother and more quickly obtained deposit. This motion is obtained from a worm driven countershaft. Lead lined vats are usually adopted.

ANODES

The anodes must be of fine silver rolled into sheets, and well annealed Sterling silver (which contains about 92.5% of pure silver) should never be used. If there is the necessary amount of free cyanide these sheets of pure silver would disintegrate thinner and thinner to the size of tissue paper but if the annealing is not good this wouldn't be the case. But the anodes should never be worked to the point of disintegration as this is only false economy, as it causes very rough deposits, and wouldn't give fine finishes. (The only way to remedy such a case if it does happen at all is to remove it from the vat and "scratch brush" it before return. Anodes should always be suspended in the solution by means of stripes cut from their sides, thus ensuring that no other metal shall be dissolved into the solution.

The anode area should always be equal to the cathode area and in a well balanced solution the anode should work clean but not too bright. Insufficient free cyanide causes single cyanide of silver to collect on the anodes and this offers undue resistance necessitating an increase of voltage to maintain the correct current density. On the other hand an excess of free cyanide causes the anode to assume a bright crystalline appearance together with evolution of gas at the cathode. This is a frequent cause of stripped deposits.

SOLUTIONS

For continuous heavy deposits there should never be less than 3½-4 ozs. of silver per gall of solution, with a minimum of free cyanide content of 2½ oz./gall. There should not be less than 9/10 oz./gall. of potassium carbonate present. When worked at temperatures not exceeding 65 deg. F. the throwing power of the solution is quite good. An increase of temperature enables the use of higher current densities but the throwing power is adversely affected. Below 60 deg. F. it is difficult to obtain smooth, easily finished deposits even with reduced current densities. Maintenance of the solution is confined to regular additions of potassium cyanide to maintain the free cyanide content. Occasional additions of silver cyanide are necessary only to replace the metal lost in the drag out. This should be in the form of double cyanide of potassium and silver containing 54% metallic silver, as in this form the balance of the solution is not upset. It is an interesting fact that a newly made solution never works as well as an old solution, even though their chemical analysis may be identical. As the solution "ages" copper will be found to be in increasing quantities. Fortunately this will not plate out so long as the silver content is more than the copper content. Usually 1 ampere hour deposits 2.58 dwt. of silver (or rather about 2½ dwts) and from this we can easily calculate the exact time required to obtain any specified deposit. Although current densities up to 7 amps/sq. ft. are possible, even densities of 4.5 amps/sq. ft. give beautifully smooth finishes. Roughly allowing for finishing, etc., we can say that a current density 4 amps/sq. ft. will deposit 1/2 oz. troy of silver per hour giving an equivalent thickness of 0,00063". Many silver plating shops have weight recording meters which are connected in series. These meters are usually calibrated in dwts. with a smaller train of indicators showing the cumulative weight deposited. The needle is usually set to the weight of deposit required and this gradually moves back to zero, at which point a cut out automatically shuts off the current and sets in an alarmbell ringing.

PLATING PROCEDURE

Jigs could be used for plating spoons and forks but these have to be carefully designed to avoid any semblance of mark where the article makes contact. Usually 24 G copper wire, with wide loose loop with bowls and prongs upwards is utilised avoiding wire marks. The usual cleaning cycle is as follows: Hot trisodium phosphate (non electrolytic), cold cathodic cyanide cleaner, acid dip, cyanide dip. This is followed by a dip in a solution of double cyanide of mercury and potassium in water and this process is known in the trade as "quicking". It should however be understood that alloys of copper including nickel silvers, with a nickel content of 15 per cent. or less will receive a non-adherent immersion coat of silver if placed directly in the silver solution. If however a thin bright immersion film of mercury is applied before they enter the plating solution the resultant deposit will be firmly adherent. In no circumstances should a

solution of nitrate of mercury be used for quicking as this will cause the thinner parts, such as spoon bowls, to crack under stress. It is not necessary to "quick" nickel silver containing over 20% of nickel.

After "quicking" the work must be well washed in running water and placed in the silver striking solution. This consists of ½ oz. silver and 4.5 oz. free potassium cyanide per gallon. The articles are left in this solution for about 30 seconds using a large anode area, and a voltage of 2 to 4 until they are coated all over with a very thin deposit of silver. The work can then without swilling. be taken straight to the plating vat. If, however a heavy deposit is required, and there is the slighest risk of any polishing dust remaining on the article, it is a wise precaution to scratch brush them using a 4 row fine brass wire circular brush, 5" dia run at 1600 r.p.m. with a lubricant composed of a teaspoonful of powdered glue dissolved in one gallon of water. After scratch brushing the whole cycle given above must be repeated, with the omission of the cold cathodic cleaner and acid dip.

When loading the plating bath it is essential that the current be flowing from the time the first article is introduced. Some platers of the older school regularly remove the work during deposition for scratchbrushing. This is entirely unnecessary as given a solution reasonably free from suspended matter, in good working balance, and with an adequate silver content, smooth deposits up to 0.002 in in thickness are easily obtained without any intermediate scratchbrushing.

On removal from the vat, deposits up to 0.0005 in thick should have a creamy iridescent appearance. As the thickness increases the colour of the deposit assumes a pure white appearance, with a lustre similar to satin. Scratchbrushing after plating is unnecessary on plain surfaces, but intricate patterns can be scratch-brushed with great advantage as this assists the finishing operation.

FILTRATION

Continuous filtration as is practised for nickel depositions is unnecessary for silver plating. An occasional filtration is of course advisable in order to remove suspended matter so as to facilitate smooth deposits. Kieselguhr may be used with advantage for this occasional filtration, but as it is attacked by cyanide solutions it cannot be used for continuous filtration. If a filter press be used the filter medium should be nylon fabric. Any emulsified oil in solution can be removed by a filtration through charcoal.

BRIGHT PLATING

Deposits may be obtained which have a semi-bright appearance by the use of the well known carbon disulphide and ether process. A slightly higher current density than usual is necessary. For spoon and forks however it is doubtful if any benefit is obtained, as the difficulty of maintaining an even balance of the solution outweighs any questionable advantage gained in the finishing process.

FINISHING

Heavy silver deposits require light mopping with lime compo, followed by bar rouge, and finally by powdered rouge and methylated spirits. Light deposits do not require the lime compo while extremely thin deposits require powdered rouge and methylated spirits only. No deposit however heavy, should ever require the use of tripoli compo. Finishing mops should be of very soft calico run at 7000 peripheral speed per minute, and for the final finishing operation, swans down mops may be used. A trace of neatsfoot oil in the rouge mixture will promote a clean finish. Without this, the heat generated in finishing

may evaporate the methylated spirits, leaving a deposit of rouge powder and dirt behind. Care must be taken not to introduce an excess of oil or the finish will be spoilt by its greasy appearance.

PACKING

All the care taken to obtain a high finish may be wasted unless it is certain that the article reaches the consumer in good condition. Tissue paper, in which spoons and forks are wrapped should be non-porous, free from sulphides, and should have a PH value of at least 6.0 Wrapped articles should not be packed in cardboard boxes having a high moisture content nor should they be stored in a damp atmosphere, or where they may be exposed to fumes of a gas fire radiator. Only if the above conditions are observed can one be reasonably sure of preventing tarnishing during the period in which the goods are stored prior to sale.

—Manufacture of Caramels and Toffees

CARAMELS are generally understood to be more or less soft eating sweets having nevertheless a definite "chew", while toffees are somewhat harder. There is no definite dividing line between toffees and caramels and in what may be termed border-line cases it is quite impossible to say to which class a particular sample belongs.

The simplest toffees are made from sugar and glucose only, with perhaps the addition of flavours, and the chief difference between these toffees and ordinary sugar boiling is merely one of cooking temperature. In the ordinary boiling the sugar is kept more or less in its original state, i.e., the hardness, sweetness and general flavour of the original sugar is unchanged and the predominating taste is that of the flavour which is incorporated. In the case of the toffee, however, the cooking is carried to such a point that radical changes take place in the sugar itself, which loses its original whiteness, begins to turn brown and to develop an entirely different flavour. To use the generally understood term, the sugar is said to carameline. This change in the sugar commences to take place at a temperature of about 320°F, and is complete at about 360°F.

All toffees and caramels take advantage of this caramelisation, and the numberless varieties in existence at the present time owe their differences chiefly to slight variations in the cooking temperature and the incorporation in different proportions of other ingredients varying from fats to flours.

Plain toffees frequently consist entirely of sugar (including glucose), and the remarks concerning this type of goods apply equally well to these simple toffees.

Turning now to a consideration of the more elaborate kinds of toffee, we find that the addition of milk and fats is made in order to impart improved and different flavour, and also to develop a softer and more pliable texture. A further step is the addition of flour to give body, chiefly necessary in the case of unwrapped goods. Other variations are brought about by the use of different sugars, the inclusion of treacle, molasses, fruits of various kinds, and both natural and artificial flavourings. In all these various toffees and caramels the sugar element occurs in a hard state, and is given an apparent softness by the intermixed ingredients. If the boiling is not correctly carried out or the proportions of invert sugar are incorrect, they will not remain stable but will either turn wet and sticky or "grain off."

It is to be remembered that in any caramel the ingredients exist in the form of an emulsion and that the sugar, fats, milks and flours usually employed are not soluble one in the other, unless, therefore, certain precautions are taken the ingredients will always tend to separate out. The main requirement in order to minimise this tendency is the careful and thorough amalgamation of the various ingredients, both before and during the cooking process.

Toffees and caramels are not generally subjected to pulling or other working as are boilings and they are usually finished cutting or moulding, which may or may not be followed by wrapping in waxed paper.

In the case of certain varieties, nuts may be included in the mass, or they may be afterwards placed on the surface, and there are also varieties in which a honey-comb like structure is obtained by the use

of something very much akin to the domestic baking powder.

EQUIPMENT

The equipment necessary for the production of toffees and caramels varies with the particular type of product manufactured and with the extent of the output. It may range from a gas-fired pan and a water-cooled pouring plate equipped with a set of cutters, to high-speed, high-pressure, steam mixing pans, elaborate pouring plates with carriers, spreaders and cutters and batch rolling machines coupled to high-speed wrapping machines, the output of each of which may be in the neighbourhood of 400 pieces per minute cut, moulded and wrapped.

BOILING PANS

Considering the simplest installation using gas fires, there is nothing that calls for comment. In small factories gas heated steam pans may be employed with satisfactory results. Steam-jacketed pans are preferable to the gas-heated pattern for caramel making, as the danger of burning and local overheating is minimised owing to the more uniform distribution of the heat. Caramel mixings are generally very thick and viscous, so that no natural circulation of the boiling mixture takes place. For this reason caramel pans require the addition of mechanical beaters or stirrers. A common pattern of stirring gear consists of two sets of beaters revolving in opposite directions. and if these are strongly made they are satisfactory. Complicated devices are undesirable as they become clogged with partly cooked materials. They are difficult to clean and result in unnecessary waste of ingredients.

The most satisfactory pan for large production of caramel goods is undoubtedly the fully jacketed steam pan fed from an external boiler, with a steam pressure at the pan of 90 to 100 lb. per sq. in. The exhaust outlet of the pan should be fitted with a suitable steam trap, capable of dealing with large quantities of condensate, as at the commencement of boiling the rate of condensation is extremely high. The draincocks usually fitted to the steam jackets should be opened when steam is first turned on, and as soon as steam begins to issue they should be completely shut off. The steam trap should then be able to take care of the condensing steam without any loss of pressure, and consequently temperature, in the steam jacket. The ideal arrangement provides for an independent steam trap to each pan in order to obviate the trouble.

COOLING PLATES

Cooling plates should be of the solid type of cast iron, i.e., all in one piece with removable side plates giving access to the water spaces; this type gives freedom from leakages caused by the sudden expansions set up by masses of hot toffee being suddenly placed on them, and it also facilitates the removal of the scale of sludge that will readily form with some types of cooling water.

CUTTERS

Slab toffees in ½ lb. cakes are often made by levelling in toffee on the cooling plates and, when it is partly set, placing upon the slabs frame-like cutters whose weight is sufficient to make the necessary indentations on the surface of the material. The cutters, composed of knife-like strips of steel tinned together after making are of necessity very fragile. They should be handled with extreme care to avoid burring the edges and causing trouble through the burrs catching in the toffee. A good plan is to keep the cutters in a shallow box, the bottom of which contains pad of felt saturated with oil, as this keeps the edges greased and helps to prevent sticking and it also minimises the risk of

damage to the edges. Where cutters are in constant use a spare set should always be available. Should one set become overheated or stuck to a batch, considerable delay will be caused while it is being washed and dried. It is of course important that the drying is thoroughly carried out.

CUTTING AND WRAPPING

There are several ways in which the cut and wrapped square can be made. In the earlier methods these operations are performed in stages. The toffee is poured on to the cooling plates and is levelled off by a special travelling carriage fitted with slabs. Cutters are also arranged on this carriage to cut the toffee into suitable squares when it is sufficiently set. In a variation of the method, the toffee is cooled on the slabs, and is subsequently reduced to a constant thickness by passing it through steel rollers or brakers. The toffee is then transferred while still soft to cutting or pressing machines for division into squares. The cutting machine is equipped with sets of rotary cutters and the toffee is passed twice under them, its position being turned through a right angle between the two cuts.

After cutting the toffees are wrapped with tissue paper of good quality. This operation is efficiently done by wrapping machine.

GENERAL ARRANGEMENT OF PLANT

The general arrangement of the plants demands a certain amount of care. Toffee boiling is essentially a "massy" operation in that steam pans need frequent cleaning; this is generally done by filling them with water and allowing them to boil over, thus cleaning them externally as well as internally. The operation is effective and has the added advantage of cleaning the floor at the same time. When milk is used, the need for frequent cleaning is great, since milky deposits will turn rancid and give rise to bad smells. During the normal process of cooking caramels, water is driven off in the earlier stages of the boiling, and if possible pans should be provided with lids and chimneys. Should chimneys not be practicable, the provision of lids is useful in that they minimise the risk of the operatives being burned by splashes of hot sugar caused by stirrers. Boiling pans should be isolated by suitable partitions from the pouring plates and also from stores of raw materials, and they should be installed on a waterproof floor.

PROCESS OF MANUFACTURE

The general process of manufacture is very easy. Essentially it consists in crushing the sugar in a sugar mill before being boiled. This operation is considered necessary to ensure success and produce caramels that will not feel gritty to the teeth.

The sugar thus crushed is mixed with glucose, cream and vanilla syrup (made from vanilla). The mass is placed in a thoroughly cleaned pan and is then boiled over a not too-sharp fire. The whole is stirred well with a spatula which should preferably be made of wood. Sponge well the sides of the pan and do not allow the coagulated parts of the milk to burn. If unsweetened chocolate is to be added, this should be done when the mass is brought to the ball point. The chocolate mass however should be thinned into a paste by being melted on a slow fire with the addition of water. Boil until hard ball consistency is gained and pour on a marble slab between iron rods. To test if the caramel has been boiled properly, allow a little quantity to dry on cold water. If it breaks with a crack the boiling is all right and not be continued. The slab should be properly greased or buttered before the syrup is dropped on it. When half warm, turn

the mass up gradually wiping the underside clean and then roll cut in thin sheets, cut and wrap.

MIXING, CUTTING AND WRAPPING

When large masses are to be dealt in at a time, it is desirable to use a pan fitted with beaters and vertical stirrers. The pan should allow of being tilted when the boiling is complete. Finally roll out into sheets and pass them through the cutter knives of the caramel cutting machines. The knives descend in a vertical direction with a shearing action and allow of differences in width and depth of cuts. Usual dimensions for these classes of articles vary from 1.3/8 in. by 1 in. by ½ in. to 5/8 in. by ¼ inch.

The pieces are then to be wrapped neatly in paper. If not properly attended to, the caramels will present most irregular shapes.

The wrapping being a tedious and difficult operation, application is made of machines for this purpose. It does the wrapping work quite neatly and quickly.

Machines have also been invented which combine cutting and wrapping operations in one. The caramel mass is fed into these machines where they are conveyed on a travelling band to cutting and wrapping appliances. The goods come out ready to be packed.

PLAIN TOFFEE

I.

White sugar	28 lbs.
Cream of tartar	½ oz.
Water	1 gal.

Butter flavour to taste.

Dissolve sugar in water, bring to boil, and cream of tartar and boil quickly to 310° to 315°F. Add flavouring essence and pour quickly.

II.

White sugar	60 lbs.
Glucose	40 "
Water	1 gal.

Butter flavour to taste.

Dissolve the sugar in water and boil. Then add the glucose. Now cook to 310°F. Add flavouring essence and pour quickly.

CREAM TOFFEE

Brown sugar	30½ lbs.
Glucose	28½ "
Full cream sweetened condensed milk	25 "
Hardened coconut oil	16 "
Salt	9 oz.
Vanillin crystals	½ oz.

Melt all the ingredients carefully in steam stirring pan, and cook to required degree, usually about 285°F. Add vanillin crystals just before pouring on plates.

TREACLE TOFFEE

I.

Brown sugar	22 lbs.
Glucose	17 "
Full cream sweetened condensed milk	22 "
Butter	11 "
Black treacle	22 "
Refined molasses	5½ "
Salt	½ lb.
Butter essence	½ oz.

Melt the ingredients and boil to about 285°F, stirring well. Characteristic bubbles are noted when cooking is complete.

II.

Brown sugar	30½ lbs.
Glucose	18½ "
Black treacle	9½ "
Skim sweetened condensed milk	23 "
Salt	8 "

Proceed as before.

CREAM CARAMELS

I.

White sugar	37 lbs.
Glucose	27 "
Full cream sweetened condensed milk	26½ "

Hardened coconut oil	12½	lbs.
Butter	7	,,
Salt	2	,,
Vanillin crystals	3	,,

Melt carefully and boil quickly to about 250°F stirring well. Add Vanillin at the latest possible moment. Caramel should be a very light colour with a soft bite. Cut and wrap without delay.

II

Brown sugar	23	lbs.
Glucose	23	,,
Full cream sweetened condensed milk	20	,,
Hardened coconut oil	20	,,
Salt	3	oz.
Vanillin crystals	1	,,

Melt sugar, glucose, milk and fat. Add salt and corn flour slowly to avoid lumps forming and boil to about 260°F. Add vanillin at latest possible moment before pouring.

CHEAP CARAMELS

Brown sugar	42	lbs.
Glucose	26	,,
Hardened coconut oil	6	,,
Wheat flour	26	,,
Salt	6	,,

Coumarin to taste.

Melt sugar, glucose and fat. Work in flour and boil to about 280°F.

—THE ART OF COMPOUNDING PERFUMES

MODERN perfumes of the oriental type are based on the odours of the fragrant woods and resins which have been used in the Far East as incense and perfumes since the days of antiquity. The basic odour components of oriental perfumes are the exotic wood scents, the ambergris odour and the vanilla-like aroma of the balsams. The perfumes are heavy, warm and sweet and have exceptional lasting power as nearly all the ingredients have marked fixative properties. The following extract from PHARMACY INTERNATIONAL will give a clear insight of compounding perfumes of the oriental type.

An almost indispensable component of oriental perfumes is East Indian sandalwood oil. The odour of this oil resembles the familiar odour of red cedar with an added fatty scent and is very tenacious. The main constituent of sandalwood oil is santalol, which is a mixture of two isomeric forms of a sesquiterpene alcohol. Santalol has an odour similar to that of the oil except that it is somewhat less spicy and it is frequently used in oriental perfumes instead of sandalwood oil. The esters of santalol have fresher, more fruity odours and may be utilized to give variations on the sandalwood theme. Cedarwood oil blends very well with sandalwood perfumes, and as it has an unobstrusive odour, it can be employed in fairly large amounts.

Vetivert oil and patchouly oil are used to intensify the woody note in oriental perfumes. The first is distilled from the roots of a grass, and the second from the leaves of a tree which grows in the Far East. The odours of these oils are closely related to sandal-wood, but they have a very noticeable musty or earthy element. Patchouly and vetivert oils have remarkably persistent odours, and are among the most valuable fixatives available to perfumers.

AMBERGRIS

The ambergris odour which plays an important role in oriental perfumes is indefinite but pleasing, somewhat resembling the odour of musk. The cost of genuine ambergris is prohibitive for all except the finest grades of perfumery, but nearly the same odour effect can be produced by the use of labdanum resinoid, which is a relatively inexpensive material. Labdanum an oleoresin derived from plants of the rock rose family, is widely used in the preparation of synthetic ambers, as its odour is very similar to the ambergris of animal origin.

The typical ambergris fragrance is also found in the essential oil of clary sage in which it is somewhat more ethereal, and in the oils of celery, angelica and cardamom seeds, where it is modified by being sharper and a little more earthy. The heavy, warm and musky scent of ambrette seed oil is also related to the odour of ambergris.

BALSAMS

The balsams contribute warmth and body to oriental perfumes. Their characteristic sweet aroma is largely due to cinnamic and benzoic acids and their esters and to vanillin. The aromatic constituents of balsam Peru and balsam tolu include benzyl benzoate and benzyl cinnamate free cinnamic acid and vanillin. Benzoin Siam contains up to 40% of free and esterified benzoic acid and as much as 5% vanillin.

Storax, which has an odour suggesting that of naphthalene, contains various esters of cinnamic acid, phenyl propyl alcohol, cinnamyl alcohol, vanillin and styrene

In very dilute solutions of storax a floral note predominates over the hydro-carbon odour. Other resins which are employed in oriental perfumes include olibanum, characterized by a peppery and woody balsamic odour, apoponax and myrrh. The balsams and fragrant gums are used in perfumery in the form of alcoholic solutions or resinoids. Storax and some of the other oleoresins also yield an essential oil.

The sweet and warm balsamic note in oriental perfumes may be strengthened by addition of synthetics. The most useful compounds for this purpose are vanillin and ethyl vanillin, heliotropin, coumarin, methyl cinnamate, ethyl cinnamate and benzyl cinnamate.

BLENDING

To modify the fundamental woody, amber and balsamic odours which are combined in oriental bouquets, it is natural to select odours which have some points in common with them. The leafy odours of oak moss and the lichens blend well with the woody odours, and orris and the ionones have an affinity for the scents of vetivert, patchouly and ambergris. The musk odour harmonizes well with all the components of oriental perfumes, accentuating the other odours. Natural musk, musk ambrette, musk ketone and musk xylene are all suitable for modifying perfumes based on sandalwood oil.

The floral nuance in oriental bouquets is usually rose, as this odour harmonizes particularly well with sandalwood, vetivert and ambergris. The rose note may be supplied in the form of natural or artificial rose oil, rose geranium oil, citronellol, geraniol or phenylethyl alcohol. Ylang ylang oil and jasmine absolute are also frequently employed as floral modifiers in oriental compositions.

Perfumes of the heavy, woody type need a refreshing top note, and bergamot oil seems to be one of the most satisfactory oils for this purpose. Lemon oil, lavender oil, linalyl acetate and citral also have a similar effect.

The typical formulas given below will serve to illustrate the principles for the compounding of oriental perfumes which have been outlined in the foregoing discussion. Oriental perfumes are particularly desirable for use in soaps because of their excellent stability and long-lasting qualities.

Those ingredients marked with an asterisk represent perfume compounds and specialties which have been developed by Schimmel & Co., In some cases the product replaces an expensive natural aromatic. In other cases it represents a refinement of the natural product. All of these are available for export from Schimmel & Co., Inc., New York 1, N. Y.

AMBRE D'ORIENT.

Oil Cedarwood	100
*Heliocrete	100
*Rose K. S. 3140	200
Geraniol	100
*Rose Otto Synthetic	50
Oil Bergamot Extrafine, N.F. VIII	50
Oil Geranium Reunion	50
Balsam Copaiba	50
*Orris Root W.	40
*Osmodor Ambrone	60
*Pogstemol	20
Oil Sandalwood E. I.	50
Resinoid Benzoin Siam	40
Musk Xylene	30
*Animaline W	20
Oil Vetiver Reunion	40
	1,000

BOUQUET PATCHOULY

Oil Cedarwood	150
*Orris Root W.	50
Oil Patchouly	100

Oil Bois de Rose	100
*Chenene	25
Oil Sandalwood E. I.	40
*Tonka-Mel	20
Oil Vetivert Reunion	30
*Heliocrete	80
Oil Geranium Reunion	50
Balsam Copaiba	60
*Rose S. 80	75
*Rose Otto Synthetic	50
Geraniol	65
*Ambergris W.	50
Musk Xylene	40
Oil Ginger	15
	1,000

"ASKHABAD"

Oil Bergamot Extrafine, NF VIII	160
Methyl Novoviolone	80
*Osmodor Iriseldis	16
Oil Sandalwood E. I.	72
Vetivert Acetate	48
*Tonka-Mel	56
*Orris Root W.	16
Oil Patchouly	48
Oil Cedarwood	80
*Jasmine 1000	24
Vetiverol	28
Oil Cascarilla	28
*Rose Otto Synthetic	32
*Rose White	16
Resinoid Benzoin Siam	40
Resinoid Balsam Tolu	24
Extrol Storax N.	30
*Muscaro W. 3% solution in alcohol	106
*Ambergris W. 3% solution in alcohol	96
	1,000

Dilute with alcohol (95%) using up to 15% of the above composition.

—SCIENCE IN THE BAKERY

THE baking of bread is a craft so ancient—as old as civilisation itself—that it might seem that scientific research could do very little to improve it. This is, however, far from being true, and the research laboratories recently opened in Britain by the baking industry provide ample proof of the many ways in which science can help the baker and confectioner.

The idea of such a research institute was conceived just before the war, but not until 1946 did it finally come into being. The new laboratory is in the country at Chorleywood, near London, and was officially opened recently. For the past two years, however, it has been actively at work, dealing with technical enquiries at the rate of nearly 1,000 a year. The laboratory is supported jointly by the baking industry and the British Government's Department of Scientific and Industrial Research.

VARIETY OF PROBLEMS

The variety of problems on which the laboratory staff is working—apart from the task of answering day-to-day enquiries—is quite remarkable and is an indication of the way in which baking has advanced from a craft to an industry. In former times the failure of a housewife's batch of bread caused very limited upset; to-day, when a single bakery may supply hundreds or even thousands of households with their daily bread, the consequences of complete failure—or continuous production of an inferior kind of bread—are far more serious.

Although the laboratory's primary function is to ascertain how the nation's bread may be brought to the highest possible quality—a long-term objective—part of its service is to advise on the day-to-day problems raised by the bakehouse, even those of the smallest village.

SOFTER "CRUMB"

To ensure that bread reaches the buyer in good condition and to avoid waste through partly finished loaves being thrown away as too stale to use, a great deal of research has been done on chemical agents for softening the crumb (the name used to denote the whole of the bread except the crust). In various countries the addition of a substance called polyoxyethylene monostearate to bread is approved as a means of making it stay soft longer. This substance is being most carefully tested at Chorleywood to see whether it is as harmless to the consumer as its advocates claim. Not until this is conclusively proved will its introduction into bakery practice be recommended.

This and other research has demanded a way of accurately measuring the softness of bread so that the effect of using different dough mixtures and different baking conditions can be carefully compared. Softness is measured by squeezing a carefully cut piece of bread between brass plates by means of weights. The amount the bread is compressed is recorded on a scale, and this gives a measure of its softness.

MAKING "BREAD PRINTS"

The texture of bread is another important factor in deciding its attractiveness, but the texture too is not easily judged merely by looking at the loaf. To measure it "bread prints" are made. To this the loaf is cut, and an even layer of ink is applied to the surface by a rubber roller. The loaf is then pressed on to paper to obtain a print which clearly in-

dicates the size of the pores in the bread. It is much the same technique as is used in taking finger prints.

The keeping quality naturally depends very much on the conditions in which it is stored, and the equipment of the laboratory includes special rooms in which temperature and humidity can be varied to test the effectiveness of various kinds of wrappings for bread and biscuits. This has proved particularly useful in preparing the wrapping for sending biscuits to tropical countries where they may be exposed to high temperature and humidity for weeks or months before they are finally eaten.

An instrument called an alveograph measures the quality of the dough used for baking. This blows a bubble from a dough disc, and at the same time records the air pressure necessary to form the bubble and the time taken to burst it.

RANCIDITY MEASURED

All products which contain fat—such as cakes and biscuits—are liable to become rancid and the manufacturer needs a way of measuring the degree of rancidity. To do this the Kreiss test is used at Chorleywood Laboratory. In this the fat is carefully extracted from a sample with a solvent, and to the solution a colourless test compound is added. This causes a pink or red colouration to form, the intensity of the colour being a measure of the rancidity.

The making of good bread depends on scrupulous cleanliness, and an important part of the laboratory's work is in advising the trade how flour and other raw materials should be stored, and what rules of personal hygiene are necessary to avoid the risk of food poisoning.

New scientific discoveries which seem very remote from baking may be turned to good account. For example, the new compounds called silicones may make it possible to dispense entirely with the age-old custom of greasing baking tins to stop the dough sticking. Silicones can give a non-sticking surface which lasts a long time.

SUBSTITUTE MATERIALS

Finally, the laboratory tests various substitute materials whose use has been suggested for baking to relieve the present-day shortage. For example, the present fat shortage has led to the use of mineral oils in cooking and careful tests have been made to see whether this is harmful or not. Present indications are that the use of any large quantities of mineral oil in cooking is a dangerous practice not to be encouraged.

Other tests of the same kind have been made on albumen substitutes put on the market for making meringues. Careful experiments have picked out the good from the bad.

BRITISH INFORMATION SERVICES.

—CULTIVATION OF BANANA

THE banana plant is a small quick-growing, very handsome tree with a herbaceous stem composed of the succulent leaf stalks, naturally propagated by suckers and forming a cluster of stems. For utility combined with magnificence, this is probably the most remarkable of tropical products.

The banana plant has no seed, but is propagated by young plants which bud from the underground tuberous stem, and bulb, as it is called, of an older plant. This bud at first gets all its food material from the parent bulb, but very long and narrow as compared with those developed later. When the young plant is 6 or 8 months old and its own bulb is 8 or 10 in. across. This is cut clean away from the parent and the roots trimmed off. It may be planted as it is, but for convenience of carrying, and to prevent its being blown over before its roots anchor it, it is cut down to within 6 in. of its bulb.

VARIETIES

The principal varieties that are ordinarily cultivated in this country are:—

Martaman, Champa, Kanthali, Chini-champak, Sabri, Anupan, Ram-rambha, Kanai-bashi, Agnishwar, Bombay, Kabuli, Singapuri, Penang, Koli-kutta, Suwandel, Anamalu, Kochi-kebul, Gros Michel, etc., Kancha-kula, which is ordinarily used as a table-vegetable, is also eaten in the ripe state by the poorer classes. Martaman and champa are the ordinary good varieties.

SOIL

The soil most suitable for the production of banana is clayloam, not subject to water-logging and situated close to a tank, ditch, jhil, or canal. The land should be ploughed up and manured with cowdung or if possible with composited manure.

MANURE

Farm-yard manure is perhaps, the best, but if a stimulant is required an application of the following mixture is recommended, the quantities being for an acre, viz:

Sulphate of potash	200	lbs.
Sulphate of ammonia	250	,,
Superphosphate	450	,,

TIME OF PLANTING

There is no doubt that, in places favoured with rich soil and good seasons. end of June is the ideal period for planting. All vegetation is then springing naturally showers during the following month help to start the eyes of the bulb in putting out leaves and roots, and when the July rains come the young suckers rush along faster than at any other time of the year.

SEED SUCKERS

The best for general purposes in planting are maiden suckers 8 months old. They are cut down to within 6 inches of the bulb, where they measure 8 to 14 inches across the cut surface. The heart eye should be destroyed, all the outside eyes cut away with the exception of the largest and fullest and the old roots cleared off If the heart eye is not destroyed, there is a tendency to form a new bulb on the top of the old one and the plant is then very easily blown over.

PREPARATION OF SUCKERS

Some planters put the seed-suckers in the ground at once; others leave them to dry for three or four days, and then plant. Others again find that they get better results by piling them in heaps 8 to 10 deep, then trash is thrown over them to keep off the sun, and they are left a month. It

is, however, better to plant at once, if the suckers are in good condition.

IRRIGATION

The water channels should be close to the suckers when first planted, but when the plants are well established the channels should be made in the centre of the rows, for if the water is applied close to the base of the stem it encourages the production and growth of suckers, and in this way unnecessarily weakens the plant. It is essential that water is supplied to young plants every five or six days, to ratoons every ten days, at the rate of two to two and a half cubic yards to each acre.

DRAINAGE

Perfect drainage is absolutely necessary for bananas. It is even more important to elaborate a system of drains for an irrigation district than to provide water channels, for more harm is done by having too much water than too little. If there is too little water the processes of life go slow, growth may cease for a time and be renewed when water is supplied again without damage being done other than delay in the formation of the bunch. But with too much water the soil becomes water-logged, decaying organic matter in the soil produces a harmful acidity and sourness, and air is prevented from penetrating amongst the interstices of the soil, which is necessary not only for the production of food material, but for the welfare of the root system. For these reasons drains are equally important on clayey soils or subsoils where water is supplied by a natural rainfall.

PLANTING

The suckers should be planted 8 cubits apart in the beginning of the rainy season. The pit should be made a cubit deep and manured with cowdung. The internals should be ploughed and crossploughed once a year, and silt from the tank, canal or jhil, applied in April as manure round the base of each clump.

CULTIVATION AFTER PLANTING

Keeping down weeds, maintaining a surface mulch, and loosening the soil are all important matters in the cultivation of bananas, as of other plants. Where there is no mulch, the compacted surface layer forcibly abstracts the moisture from the layers below it, and evaporates it from its surface; while the mulch of loose surface soil of decaying vegetable matter is unable to take any moisture from the denser subsoil, which is therefore protected from evaporation.

Surface mulching, which consists in keeping a deep layer of the top soil in a dry, loose, granular state, has two effects. First, by rendering the top layer more porous, or rather by rendering the surface pores larger, it lessens considerably the run-off in the case of heavy showers. Its chief object, however, is to make evaporation difficult by destroying the capillary pores and tubes through which the soil moisture is brought under the active evaporating influences of the atmosphere.

PRUNING

Pruning away such suckers as are not intended to yield fruit is a most important operation. It should be done when the sucker is not more than one or two feet high. The larger the sucker grows, the more food material it abstracts from the parent bulb, and the more its young roots interfere with the root system of the plant, in both ways, injuring the future bunch.

It is erroneous to believe that the plan of constantly pruning the banana must do serious injury to the plant. But on the other hand plants of the type of banana throw out numerous suckers, and also produce fruit.

The suckers are rival competitors of the mother plant in getting food material from the soil.

They do not help the mother plant, but are partly fed by it, and partly steal its nourishment in the soil.

When cutting away the suckers care should be taken to apply the cutlass, so that it does not point towards the plant, otherwise it is easy to injure it. If the suckers is not cut away quite down to the white, hard part, it will soon spring again, and therefore time and labour are saved by doing it thoroughly at first.

PRUNING LEAVES

As the first leaves decay, they hang down all round, protecting the stem from the full glare of the sun. If they are cut away, the sheathing leaf stalks, which form the outside of the trunk, dry up and do not perform their proper functions it is well to leave them, even in the shade of a banana walk, unless it happens that the plants are clustered closely together, when too much shade causes the stem to lengthen out and become weak and brittle. In such a case some of the dead hanging leaves may be pruned away. The hanging dead leaves must not be allowed to trail on the ground, as they encourage the production of roots coming to the surface unless green mulching is practised. Some planters prune away even some of the green leaves but this cannot be recommended, as it interferes with the food supply. If, however, a leaf is seen to be growing through a bunch, and as it would, if left, cause some deformity of the fruit, it is carefully removed from its position with the pruning tool.

FRUITING

When the plant is about 12 months old, the enormous flower-stalk, 3 to 4 feet or more in length, issues from the centre of the crown of large leaves, and curves over with its weight. The flowers are in clusters, alternating with large reddish succulent scales, which drop off as the fruit stalk develops. The ovaries of the flowers rapidly grow into large finger-like fruits, which are borne in combs or clusters.

When the bunch of fruits has formed the portion of the inflorescence hanging on, should be cut away and a little slaked lime should be smeared at the cicatrix that the nourishment which would have been washed on it.

The first bunches of fruit may be obtained about a year from the time of planting, while the subsidiary suckers produce fruit when from 12 to 15 months old. Each stem dies after fruiting and is replaced by others, the clump thus continuing productive for several years. Under good tillage, an acre is considered to produce 350 to 400 or more bunches annually.

HARVESTING

As soon as the bunch is ripened the tree should be cut down from the base and the bunch, with the whole of the plant, topples slowly over, care being taken that it does not fall against and injure any other plant.

REPLANTING

In replanting all suckers should be taken out after a year, i.e., in the next May, June or July and planted elsewhere, if necessary. If it is intended to keep up the old plantain garden for a second, third or fourth year, instead of planting suckers at the old spots or letting the suckers already there grow undisturbed, the planting should be done on the 2nd year between the two original lines and in subsequent years also in new spots, that the whole of the soil of the garden may be made use of by the plantain crop before it

is abandoned for a new garden. This is not the system prevalent in West Bengal, where the old clumps are kept up by manuring, but it is the system adopted in East Bengal especially in Dacca.

The suckers planted should not be too large, and they should be diverted of all expanded leaves as they are planted. The only operation needed after the suckers have been planted is the heaping up of earth round each, if the Dacca system is followed. The leaves should not be cut away except from trees that are cut down after they have borne fruits.

Before concluding this article it is not out of place to mention the introduction of a new type of banana from West Indies.

Gros Michel is the variety of banana which is extensively grown in the West Indies and shipped to Europe and America in large quantities in specially fitted and air-conditioned steamers. The home of this banana is said to be somewhere in the Far East; viz. Siam, Java or Malaya. It is known in Malaya as Pisang emben, Siam as Klui ham, Burma as Thihmwe and Ceylon as Anamalu. Strange enough, it is not found in South India which is the home of many varieties of banana. Two strains of this variety, one from Honolulu (Hawaii) under the name Blue Field, and the other from Trinidad West Indies, under the name Gros Michel, were obtained and tried in the banana plot attached to the Agricultural Research Institute, Coimbatore. Both proved to be same when grown at Coimbatore. The bunches are large with 7 to 9 hands and each hand with 16 to 20 fruits, each 7 in. long. The bunch is very compact and the fruits are fairly strongly attached to the pedicel. The pulp is very sweet with excellent flavour and at flecked stage it actually 'melts' in the mouth. It is an excellent dessert banana. It thrives well under all conditions of soil and climate up to an elevation of 4,500 ft. It is a good banana both for export and home use.

Breeding out superior clones in banana has not yet been a great success. But sports of superior clones are quite a common occurrence in this crop. The easiest method of improvement of banana, therefore, is by the trial of all the best known banana varieties in a suitable place and distributing them after acclimatization and multiplication. Gros Michel is an ideal variety for trial. A few suckers may be available for distribution with the Superintendent, Central Farm, Coimbatore.

—PHOTO PRINTING

THERE is a great variety of photo printing processes, of which the silver printing processes are perhaps the best and form the bulk of professional work. They are divided into two classes, those in which the image is printed out by daylight to the full depth required, and those in which a latent image is formed by artificial light, and afterwards developed.

The silver processes are chiefly based upon the sensitiveness to light of silver chloride, silver citrate, and silver bromide.

The processes required for the "print-out" class of papers are:—

1. Printing or exposing.
2. Toning.
3. Fixing.

The processes for the developed class are:—

1. Exposing.
2. Developing.
3. Fixing.

Most of the print-out class of papers give a disagreeable red colour if simply fixed; and "toning" with gold or platinum is necessary. But with the developed class the developed image of silver is pleasant to look at and therefore no toning is required.

Sensitive papers ought not to be exposed in the frame until they are quite dry. The shutter at the back of the frame is removed, and the negative laid flat upon the glass, collodion-side upper-most. A sheet of sensitive paper is then placed upon the negative, sensitive-side downwards; next comes a layer of thick felt; and the whole is then tightly compressed by replacing and bolting down the shutter. The amount of pressure required is not very considerable, but if the springs of the frame become too weak after a time, a few pieces of mill-board may be placed beneath them. The time of exposure to light varies much with the density of the negative and the power of the actinic rays, as influenced by the season of the year and weather. If the exposure to light has been correct the print appears slightly darker than it is intended to remain. The toning bath dissolves away the lighter shades, and reduces the intensity, for which allowance is made in the exposure to light. A little experience soon teaches the proper point; but much will depend upon the state of the toning bath, and albumenized paper will require to be printed somewhat more deeply than plain paper. If, on removal from the printing-frame, a peculiar spotted appearance is seen, produced by unequal darkening of the chloride of silver, either the nitrate bath is too weak, the sheet removed from its surface too speedily or the paper is of inferior quality. If in the exposure to ordinary diffused daylight the shadows of the proof become very decidedly coppery before the lights are sufficiently printed, the negative is in fault. Ammonionitrate paper highly salted is particularly liable to this excess of reduction, and especially so if the light is powerful.

TONING

The print should be first washed in common water until the soluble nitrate of silver is removed. This is known to be the case when the liquid flows away clear the first milkiness being caused by the soluble carbonates and chlorides in the water precipitating the nitrate of silver. Ten minutes in water running slowly from a tap will be sufficient to cleanse a print from nitrate of silver; or three or four changes in a dish, pouring off quite dry between each change. It is an ad

vantage to finish off with a solution of salt (2 grs. to the oz.). Pour the tonic bath out into a flat dish, and put the prints into it 2 or 3 at a timewaving the dish meanwhile backwards and forwards to secure a constant movement. Continue to keep the prints moving, and watch the changes in colour. If the prints are removed as soon as the blue colour of the gold is seen, they will usually change in the fixing bath to a warm shade of brown; but when left for 2 or 3 minutes longer in the toning bath, the darker tint becomes permanent.

FIXING

One oz. of hyposulphite of soda dissolved in 6 ozs. of water would fix two batches of stereoscopic prints, 20 in each batch. Allow the prints to remain in the fixing baths for 20 minutes, with occasional movement, after which they may be transferred to a dish of clean water.

WASHING

It is essential to wash out every trace of hyposulphite of soda from the print, if it is to be preserved from fading, and to do this properly requires care. Always wash with running water when it can be obtained, and choose a large shallow vessel exposing a considerable surface in preference to one of lesser diameter. A constant dribbling of water must be maintained for 4 or 5 hours, and the prints should not lie together too closely, or the water will not find its way between them. When the prints have been thoroughly washed, blot them off between sheets of porous paper and hang them up to dry.

MOUNTING

Mount the proofs with a solution of gelatine in hot water, freshly made; gum-water, prepared from the finest commercial gum, and free from acidity, may also be used, but it should be made very thick, so as not to sink into the paper, or produce "cockling up" of the cardboard on drying.

POSITIVE PRINTING BY DEVELOPMENT

Negative printing processes will be found useful during the dull winter months, and at other times when the light is feeble, or where it is required to produce a large number of impressions from a negative in a short space of time. The proofs, however, as thus obtained are not equal to direct sun-prints in beauty and graduation of tone. Take of iodide of potassium, 120 grs.; bromide of ammonium, 30 grs.; water 20 ozs. Float the paper on the iodizing bath until it ceases to curl up, and lies flat upon the liquid; then pin up to dry in the usual way. Render sensitive upon a bath of aceto-nitrate of silver, containing 30 grs. of nitrate of silver with 30 minims of glacial acetic acid to each oz. of water. Place the dried sheets in contact with the negative in a pressure frame, and expose to a feeble light. About 30 seconds will be an average time upon a dull winter's day, when it would be impossible to print in the ordinary way. Develop by immersion in a saturated solution of gallic acid. After the picture is fully brought out, wash in cold and subsequently in warm water, to remove the gallic acid, which, if allowed to remain, would discolour the hyposulphite bath. Fix the print in a solution of hyposulphite of soda, one part to two of water, continuing the action until the yellow colour of the iodide disappears. Wash thoroughly in plenty of water.

—PHARMACEUTICAL RECIPE

STAINLESS IODINE OINTMENT

Iodine	1	oz.
Oleic acid	4	„
Soft paraffin	14	„
Hard paraffin	1	„

Dissolve the iodine in the oleic acid and mix intimately with the paraffins.

FLUID EXTRACT OF PUDINA

Pudina, in coarse powder	100	grams.
Alcohol	600	c. c
Distilled water	300	„

Mix 600 c. c. of alcohol with 300 c. c. of distilled water, and having moistened the powder with 340 c. c. of the mixture, pack it firmly in a cylindrical percolator then add enough menstruum to saturate the powder and leave a stratum above it. When the liquid begins to drop from the percolator, close the lower orifice, and having closely covered the percolator, macerate for 48 hours. Then allow the percolation to proceed, gradually adding menstruum, using the same proportions of alcohol and water as before, until the pudina is exhausted. Reserve the first 850 c.c. of the percolate.

Distill off the alcohol from the remainder by means of a water bath, and evaporate the residue to a soft extract, dissolve this in the reserve portion and add enough menstruum to make the fluid extract measure 1000 c.c.

GRIPE CURE.

Spirit ammon Co.	3	dr.
Potash bicarbonate	1	oz.
Simple syrup	32	„
Aqua caraway concentrated	1	„
Aqua anise, concentrated	1	„
Aqua anethi, concentrated	2	„
Distilled water	4 pts.	4 oz.

Dissolve all the ingredients in the distilled water one by one.

LIVER PILLS

Aloin	6	gr.
Dry extract of nuxvomica	6	„
Exsiccated ferrous sulphate	6	„
Myrrh	6	gr.
Hard soap, in fine powder	6	„

Syrup of liquid glucose—a suffici quantity.

Mix to form a mass and divide into 2 pi
Dose :—1 pill.

COMPOUND CINNAMON POWDER

Cinnamon, finely powdered	4	oz.
Cardamom, finely powdered	4	„
Ginger, finely powdered	4	„

Mix.

ARTIFICIAL CARLSBAD SALT

Sodium sulphate	550	grams.
Potassium sulphate	10	„
Sodium chloride	100	„
Sodium carbonate	350	„
Distilled water	550	c.c.

Dissolve the potassium sulphate and sodi chloride in the water, and add the solution the sodium carbonate and sodium sulph previously melted in a dish; evapo until the weight of the product is 1000 gr and set aside to cool, stirring frequently so to avoid the formation of large cryst Distribute any remaining mother liquor formly over the crystals, and dry by expos to the air.

Dose :—2 to 6 grams.

INDUSTRIAL SKIN PROTECTIVE CREA

Benzoin	5	parts.
Yellow beeswax	2	„
Wool fat	5	„
Alcohol to make	100	

This product provides an invisible gl which protects against organic agents. It n be removed with an organic solvent.

MOUTH WASH CONCENTRATE

Oil of cinnamon	1	c.c.
Oil of cloves	1	„
Oil of peppermint	1	„
Oil of anise	·1	„
Soluble saccharin	1	grm.
Zinc chloride	6	„
Sorbitan monolaurate	12	c.c.
Distilled water to make	30	„

Mix the oils with the sorbitan monolau Dissolve the zinc chloride and saccharin sufficient distilled water to make 14 c.c. the aqueous solution with mixture of the and sorbitan monolaurate. A clear solu providing a pleasant mouth wash, is for when 5 drops are added to one ounce of wa

—Recipes for Small Manufacturers

TARTAR REMOVING TOOTH PASTE.

Precipitated chalk	25 parts.
Neutral white soap	2 „
Magnesium carbonate	8 „
Bentonite	3½ „
Sodium bicarbonate	6 „
Glycerite of starch	28 „
Irish moss infusion (2% in water)	28 parts.
Saccharin	¼ part.
Flavour	1 „
Liquid paraffin	1 „

Mix in a paste mill and put in collapsible tube.

SYRUP POWDERS.

The method of the manufacture of different syrup powder is identical with the exception of the flavour and colour.

BASE.

Powdered citric acid	1 oz.
Powdered refined sugar	15 oz.

To make the flavoured powders, proceed as follows:—

Put about 4 oz. of the powder into a mortar and spray or drop the mixed flavouring materials over it slowly mixing well. When all have been added, gradually add the remainder of the acid, mixing well after each addition. The colour should be dissolved in the flavouring mixture before adding the acid. When well mixed, place in a glass dish and stir often until it has dried out sufficiently to admit of packing. Next put up in glass bottles with closely fitting stoppers, but may be put up in cans.

MOTOR GREASE.

Lime, slaked to powder	100 parts.
Tar oil	300 „
Paraffin oil	800 „
Rosin oil	300 „
Caustic soda lye, strong	12 „

Place the slaked lime and the lye in a pan and stir in the rosin oil until the whole mass becomes white. Gently warm the mixture and stir in the tar oil followed by the paraffin oil, 800 parts of powdered soap stone being finally added. Stir the finished composition until homogeneous.

ROOF STOPPING.

Rosin	56 lbs.
Paraffin wax	20 „
Calcined flint	40 „
Raw linseed oil	3 gals.
Red lead	3 lbs.
Wood tar	3 „
Slaked lime	3 „

Boil the oil with the red lead, melt in the rosin and the wax. Heat the tar and lime together, add to the oil mixture, then add the calcined flint and thoroughly mix.

ORNAMENTING EGGSHELL.

Make a small hole at each end of an egg and blow out the contents: then cover the openings with sealing wax and fasten on two matches as spindles. Make a support having a bottom piece 7 in. by 2 in. by ½ in. and two uprights with notched tops, each 4½ in. by 1 in. by ½ in., placed 5 in. apart. Melt white wax in a convenient jar, which must be placed on the stand between the uprights and under the egg, resting by the spindles in the notched pillars. Brush wax evenly over the egg, turning it round without fingering the shell. When dry, draw the required picture with a hard lead pencil, penetrating through the wax in order to expose the shell where lines are drawn. Next soak it in strong vinegar for twelve hours, putting something weighty over the jar to keep the egg under the liquid; the vessel should be narrow to prevent the egg from floating horizontally. Go over the design with a needle, scratching away the corroded portions; then brush black writing ink plentifully over the egg, let it dry, and remove the wax with hot water very carefully, for the shell is liable to burst during this performance. The ink has soaked into the etched lines, and the picture shows up well on the uncoloured shell. A thin coating of mastic varnish improved the appearance.

FALSE TEETH CLEANER

Finely powdered pumice	1 lb.
Sodium bicarbonate	4 oz.
Powdered soap	2 oz.
Precipitated chalk	4 oz.

Mix. This will clean and sweeten plates, remove stains and give fine satisfaction.

To use shake some of the powder on the wet plate and brush with an ordinary tooth brush.

DRY CLEANING FLUID.

Glycol oleate	2 fl.oz.
Carbon tetrachloride	60 „
Naphtha	20 „
Benzine	18 „

This is an excellent cleanser that will not injure the finest fabrics.

AUTO POLISH.

A good liquid car polish can be made from:—

Naphtha	2½	pints.
Mineral oil	2½	,,
Diglycol laurate	4	,,
Ammonia liquor	1	oz.
Water	1	pint.
Glycerine	1	,,
Formaldehyde	8	oz.
Fuller's earth	9	,,
Bentonite	6	,,

Mix the oils together, add the abrasive powders and then the water, glycerin and formaldehyde. Mix rapidly until a smooth product results.

WHITE SHOE DRESSING

Lithopone	19	oz.
Titanium dioxide	1	,,
Shellac (Bleached)	3	,,
Ammonium hydroxide	½	fl. oz.
Water	25	,, ,,
Alcohol	25	,, ,,
Glycerin	1	oz.

Dissolve the last four ingredients by mixing in a porcelain vessel. When dissolved stir in the first two pigments. Keep in stoppered bottles and shake before using.

LABEL PASTE FOR TINS

Wheat flour	8	oz.
Alum	½	,,
Caustic soda	2	dr.
Water	32	oz.

Dissolve the alum and caustic soda in the water, and the wheat flour and rub to produce a smooth paste, then heat, with constant stirring, until a stiff paste result. By further cautious heating the paste can be reduced to powder, which is mixed with water for use.

RAT POISON

White arsenic	1	oz.
Wheat flour	6	,,
Tallow	2	,,
Prussian blue	5	,,
Good flour to make up to	1	lb.

Melt the tallow and pour quickly on to the dry ingredients which have been well mixed previously, stirring well until a stiff paste is produced, then add the oil of aniseed.

NURSERY POWDER

Corn starch	100	parts.
Orris root powder	200	,,
Zinc oxide	200	parts.
Fuller's earth	100	,,
Boric acid	20	,,
Lycopodium powder	200	,,
French chalk	100	,,
Rose oil	1	part.
Bergamot oil	6	parts.
Neroli oil	2	,,
Heliotropin	1	part.

Mix and pass through a fine sieve for several times to ensure thorough mixing.

WAX PENCILS

Ceresin	40	parts.
Carnauba wax	32	,,
Japan wax	24	,,
Talc	50	,,
Colour		q.s.

Melt the waxes together, add the talc and colour, and heat on a water bath for approximately 30 minutes, then pour into suitable moulds.

The colours used are :—

White—Zinc oxide	15	parts.
Blue—Paris Blue	12½	,,
Red—Cinnabar	15	,,
Yellow—Chrome	15	,,
Black—Lampblack	8	,,

NAIL ENAMEL

Acetone	400	lbs.
Butyl acetate	300	,,
Ethyl lactate	200	,,
Dibutyl phthalate	100	,,
Phenyl ethyl alcohol	½	fl.oz.
Cellulose nitrate	25	oz.
Eosine (alcoholic solution)		q.s.

Dissolve the cellulose nitrate in a solution of acetone, butyl acetate, and ethyl lactate. Add the dibutyl phthalate and finally the phenyl ethyl alcthol and the colour solution.

When preparing the above articles be careful to have no flame near as some of the ingredients are very inflammable.

VALVE GRINDING PASTE

Ammonium linoleate	10	parts
Oleic acid	1	part.
Water	50	parts.
Green Silicon carbide	50	,,
Powdered quartz	15	,,

Mix. Keep wet while applying.

BLACK FLEXIBLE LEATHER VARNISH

A good varnish may be prepared as follows:—

Shellac	100	parts.
Gum sandarac	25	,,
Venice turpentine	25	,,
Pale rosin	25	,,
Castor oil	20	,,
Nigrosin (Spirit soluble)	15	,,
Methylated spirit	790	,,

Place the ingredients in the methylated spirit and shake at intervals until dissolved. Lastly strain through linen and bottle for use.

—IN THE FIELD OF INVENTION

CONTINUOUS STEEL-CASTING.

One of the far-reaching developments in steel-casting, which promises to revolutionize the steel industry, is the continuous steel-casting method developed by Prof. Sachs, Director, National Metallurgical Laboratory, prior to his coming to India. The new method dispenses away with the reheating and rolling process of the conventional process and saves space and expense.

In this process the steel is poured into an oval-shaped mould, where it starts to solidify uniformly and quickly. The steel flows from the mould through a sleeve-like insulated chamber below the mould, which equalizes the temperature of the steel as it further hardens. As the metal is withdrawn, it is cut into billet-size length by an automatic oxy-acetylene torch. The steel, then in a semi-finished shape, is ready to be sent to the finishing mill.

One of the most difficult tasks in the development of the process was finding the correct oval shape for the mould. By the use of zinc and aluminium alloys the behaviour of steel in the oval mould was modified and the correct mould shape facilitating the freezing of steel was determined.

—Journal of Scientific & Industrial Research.

IMPROVED BAKER'S YEAST

A new process for the manufacture of baker's yeast, the Deloffre Alcohol Process, named after the inventor, promises to improve world's yeast industry, according to a recent Australian report. The yeast, in this process, is made in one operation by inoculating a highly concentrattd solution with a culture of pure yeast, which is then fermented to set up the required biological reactions under which yeast can absorb alcohol.

The advantages of the process are many. Due to the high alcohol concentration in the fermenting liquid, fermentation takes place under sterile conditions without any bacterial contamination. The manufacturing process is simplified, the production cost cut by 30 per per cent., yield increased by 20 to 25 per cent. and the yeast produced has exceedingly high keeping qualities because high alcohol concentration reduces the protease content of yeast, and has better baking properties with subsantially greater leavening power.

The entire process is automatic and a special feature of the plant is that the pipe lines conveying the materials are kept to a minimum length.

Australia uses about 8,000,000 lb. of yeast each year for baking purposes and 80 per cent. of it is produced by the Deloffre Alcohol Process (Agricultural Newsletter, Australia).

NEW PLASTIC.

Table surfaces particularly suitable for canteens in heavy industries, since they can take the roughest and dirtiest of wear without losing their surface, and require no cleaning other than wiping down with a damp cloth, are now made possible by the introduction to this country of a new surface material known as Formica and made by Messrs. De La Rue Insulation, Ltd.

A decorative laminated plastic, Formica possesses the hardest known surface of similar materials, and it cannot be scratched by normal use. It is stain-proof and a special grade is also available which will allow a cigarette to smoulder on its surface without leaving a trace of burn, blister or stain.

—Chemical Products.

NEW BUILDING PRODUCT.

New product now being manufactured in this country by Messrs. Dohm, Ltd., London, S.W.1, it is claimed, a wide range of possibilities including building and civil engineering materials and agriculture.

The new product—Vermiculite—is derived from raw vermiculite ore which is heated to about 2000°F., when the moisture becomes steam, exploding these flakes apart like an accord on opening up, and forming pellets containing millions of tiny air cells.

In the expanded state, the particles actually look something like tiny accordions, seem light as air, and are metal-hard and fireproof. Vermiculite expands from nine to sixteen times its original size and weighs only from seven to ten pounds per cubic foot. Vermiculite particles will soak up water.

Because of its ultra-light weight, expanded vermiculite is currently being used more and more to replace sand and gravel in many types of masonry construction such as plaster.

stucco, floors, walls, bricks, and building blocks. Portland cement or gypsum are used as binders, just as when sand and gravel are used.

—CHEMICAL PRODUCTS.

ELECTRICAL DRYING CABINET.

The Manesty-Mitchell drying cabinet shown at the B.I.F. and having application to the chemical industry, is arranged to accommodate 10 trays, each 32 ins. by 16 ins. by 1¼ in. deep, spaced 3 ins. apart.

It is of rigid steel frame covered with panels of double sheet steel insulated between with special asbestos insulating materials and fitted with double doors at the front, and is complete with angle slides for tray, air inlets and outlets.

Heating is by strip heaters suitable for working temperatures up to 150°C. complete with combined thermometer and indicating type thermostat for controlling temperature over the full range. Readings are in degree F. and degrees C. (approximately 20/220°C., 60/430°)F.

Fans circulate air, and these are fitted with self-aligning ball bearings, and driven by electric motor.

A NEW TYPE OF VACUUM CLEANER.

A new cleaner, designed in America, picks up dirt and dust through a hose, combines it with a stream of water, blows it down the sink, and thus rids the housewife of the bothersome chore of emptying the vacuum cleaner bag.

The machine is made possible by the use of a highly flexible rubber hose called Multi-Flex, produced by United States Rubber Company. The hose can be pulled out and compressed like an accordion. It will stretch to five times its original length, enabling a housewife to clean all the rooms on one floor of her home without moving the machine. The hose has no wire or fabric reinforcement. It will not collapse under suction and when stepped on will afterwards return to its normal shape. It is highly resistant to abrasion and will not scratch furniture or other valuable objects in the home.

It is understood that the cleaner is now in production on a small scale by Hydroway, Inc., of 201 North Broad Street, Philadelphia.

—RUBBER DEVELOPMENTS.

GLYCERINE REFINING

A recent invention by the Nopco Chemical Co., relates to the refining of crude glycerine produced by saponification and alkyl esterific tion methods (Chem. Age, 1949, 60, 478).

Briefly, the process consists in separatin the acidic glycerine from the esterification mas neutralizing with alkali, heating the neutr lizod glycerine with ammonium chloride an removing the insolubles. Neutralizing t alkali may be effected before separating t glycerine. The refined and substantiall anhydrous glycerine may be further purified t distillation, co-distillation with mineral oil, c by solvent extraction, or a combination of thes

900 parts of groundnut oil were reacted wit methanol in the ratio of 15 molecules c methanol to 1 molecule of glyceride, with 1 pe cent. sodium hydroxide as catalyst. The mixtu was refluxed for an hour, cooled, acidified wit 20.2 parts of concentrated sulphuric acid an refluxed for another 4 hr. The reaction mixtu separates into layers and the lower glycerin layer was drawn off; 36 parts of barium oxid were added to the glycerine layer and th mixture heated for an hour on the steam batl It was then cooled, 29.5 parts of ammoniu chloride added and further heated for an hou Most of the methanol associated with th glycerine was then distilled off and the reactio mass filtered. The crude glycerine obtaine was distilled under reduced pressure, yieldin an odourless, water-white, anhydrous glyceiin of pH 7 in 83.7 per cent yield.

In the second method, the crude anhydrou glycerine was first neutralized with calciu carbonate, either before or after the removal c glycerine from the mass, and the insolubl material removed by filtration. The glycerin may be heated for a short time at about 60(for 30 min. on the steam bath to aid filtratio Barium chloride is added along with mor alcohol to increase fluidity. This eases handlin and prevents loss of glycerine. After thes additions, the mass is again heated at 60° t 120°C for 30 to 60 min. at the reflux tempera ture of alcohol. Insolubles are again remove by filtration and any residual alcoho distilled off.

—JOURNAL OF SCIENTIFIC & INDUSTRIAL RESEARCH

STEEL FROM SCRAP

A new method of making steel from scra has been developed by a British firm which wil enable rolling mills to make some of their ow billets instead of having to buy and transpor them from steel makers. The secret of th process is a flux mixture poured on to red ho scrap.

—FORMULAS, PROCESSES & ANSWERS

NEEM TOOTH POWDER.

Charcoal	20 grs.
Chinaclay	20 „
Precipitated chalk	60 „
Neem leaves	10 „
Camphor	3 „
Peppermint	3 „
Rosemary oil	1 gr.
Pigment colour (green) traces.	

Reduce charcoal and chinaclay to powder separately. The neem leaves are dried, powdered and sifted. Then mix the ingredients intimately.

HAIR FIXER.

4147 P.C.W., Agra Cantt—Wishes to have a good formula of hair fixer.

(a)	Distilled water	700 parts.
	Glycerin	30 „
	Borax, powdered	25 „
(b)	Tincture of benzoin	225 „
(c)	Essence of rose or jasmine	10 „

Make a solution (a), and add (b) with good stirring and in a thin jet, and (c). Allow to stand for 3 to 5 days to mature. Filter and bottle.

LEAD ACETATE.

4508 P.P., Amritsar—Desires to know the process of preparing lead acetate.

Litharge	7 parts.
Acetate of lead	10 „
Distilled water	40 „

Boil all together for half an hour, and then evaporate down to one-third the volume and set aside to crystallise out of contact with air.

TURPENTINE OIL AND ROSIN

4524 M.P., Bilaspur—Wishes to learn the process of extraction of turpentine oil and rosin.

Turpentine oil is usually manufactured from oleoresin a gummy substance obtained by tapping chir pine (Pinus longefolia) a species of plant found in large numbers in the Punjab and the United Provinces.

To extract the oil, melt the oleo-resin by the help of steam. In order to enhance the process add a little turpentine oil obtained from previous operation. By this treatment the dirt, water and other suspended impurities will sink to the bottom of the vessel. Then transfer the clear oleo-resin into a suitable tank, from which from time to time a measured quantity of the substance is passed into the distilling vessel, which is provided with a steam jacket and kept hot by steam under pressure to maintain any desired temperature. Inject the steam under pressure whereby the oil of turpentine together with water vapour is distilled over. Lead the vapour through an empty vessel and then into a condenser. The object of putting the empty vessel into the intermediate position is to each any oleo-resin that may have come over during the process. The liquid turpentine and water which collect in the receiving vessel at the further end of the condenser are now separated from each other mechanically. The oil thus obtained contains much impurities which may be removed by redistilling the oil in a separate vessel and passing through lime water. The purified oil still contains traces of water which are at present removed by storing the oil for a time in bulk.

The residue left in the still on cooling sets to a hard, brittle mass and is known as rosin. This may be drawn off while the still is moderately hot and pour into wooden barrels.

TANNIC ACID.

4596 H.L.G., Rohtak—Desires to know the process of preparing tannic acid.

For the manufacture of tannic acid on a large scale galls are preferably employed owing to their richness in tannin. The finely powdered material is stirred with sufficient water at 50°-60°C. to form a concentrated aqueous extract and after filtration the clear liquid is agitated with one fourth of its volume of ether until an emulsion results. After standing for several days, the upper ethereal liquid which has separated is removed, and the lower layer, which contains all the tannin matter is run into a still and the ether which is present recovered. After cooling the syrupy liquid is spread out on sheets of tin, and heated by means of a steam coil, when the gallotannic rapidly puffs up and dries.

Thus prepared the commercial tannic acid contains some quantity of gallic acid and other impurities; to remove these the material may be washed with ether or the aqueous liquid fractionally precipitated with common salt, the precipitates dissolved in ethyl acetate, and the

tannin recovered by evaporation under reduced pressure.

GREEN FOUNTAIN PEN INK

4045 R.V.N., Poona—Wishes to have good recipe of fountain pen ink.

Emerald green	1	oz.
Naphthol green	1	„
Gum arabic	½	„
Hot water	100	fl.oz.
Boric acid	50	grms.
Rect. spirit	1	oz.

Dissolve the ingredients in hot water and keep aside to cool. Then add the rectified spirit and bottle.

BLUE FOUNTAIN PEN INK

Acid violet	4	dr.
Ink Blue	2	oz.
Gum arabic	1	tola.
Sulphuric acid dilute	1	oz.
Carbolic acid	½	„
Boiling water	40	fl.oz.

Mix and keep aside for one week. Then filter and bottle.

PREPARATION OF BORNEOL

4151 S.R.M., Kumbakonam—Wishes to have the process of preparing borneol.

The starting point of this substance is the pure turpentine oil. Take pure turpentine oil and pass through it dry hydrochloric acid gas. The temperature of the mixture should be kept cooled by putting the containing vessel over ice, the solidified pinene hydrochloride is produced.

Next take 10 parts of pinene hydrochloride in a suitable vessel and mix with it 13.8 parts borax and 15 parts water. Heat the mixture under pressure at 220°C for a few hours Then distill the mixture in steam whereby camphene boiling below 160°C free from chlorine is obtained. Now converse this camphene into borneol. For this purpose take 100 parts camphene; 250 parts glacial acetic acid and 10 parts of sulphuric acid (50 per cent. solution). Heat the vessel to about 60°C with continuous agitation till a perfect solution is obtained (two or three hours). On adding water, isoborneol acetate separates as an oil, which on hydrolysis gives isoborneol. The solution left on cooling produces borneol.

SYNTHETIC JASMINE

4366 M.C.I.E., Gulbarga—Wants to have a process of preparing synthetic jasmine.

Synthetic jasmine is chemically known as benzyl acetate. It may be prepared as follows:—

Benzyl acetate is a colourless, sweetle sweetsmelling, fruity liquid. 5 parts of benz chloride, 4 parts of glacial acetic acid and parts of fused sodium acetate are boiled f about 24 hours when the reaction is complet The acetic acid merely acts as a solvent. Th esterification is followed by taking, from time t time, samples and estimating the unchang benzyl chloride; when it is complete the exce of acetic acid is distilled off, the residu is washed with water and distilled at 21°C.

TEA TABLETS

4594 G.B., Achnera—Wants to know process of making tea tablets.

Dilute 20 lbs. of fresh cow's milk with lbs. of water. Infuse the mixture with 24 o of any good tea, say, orange pekoe. Boil gentl over a mild fire for a few minutes and the strain. Add to the filtrate 6 lbs. of refine sugar and thicken it by boiling down. St continuously until it is pasty and then pou into a buttered mould of tin. Allow to coo and when solidified cut into blocks of desire size and weight and at once pack into tin pot without touching by hand.

To use the tablet subsequently dissolve a cube in a cup of hot water and drink.

MARGARINE

4570 A.M., Colombo—Wants to have a process of making margarine and also flavouring essences, etc.

Margarine is made by dispersing 200 parts of sour milk in 1000 parts of a molten mixture of cottonseed and coconut oils with the aid of 5 to 15 parts of an emulsifying agent (glyceryl mono-stearate).

FLAVOURING ESSENCES.

The following are some of the important artificial fruit essences:—

PINEAPPLE ESSENCE

Butyric ether	32	oz.
Amyl acetate	8	„
Lemon oil	1	„
Orange oil	½	„
Vanillin	½	dr.
Jasmin oil	15	mins.
Bois de rose	1	dr.
Alcohol	2½	gals.
Distilled water	2½	„

Mix. Use 1 oz. of this essence to 1 gallon of syrup.

RASPBERRY ESSENCE

Butyric ether	4	oz.
Amyl butyrate	2	„
Amyl acetate	2	„
Acetic ether	1½	„
Sebacic ether	½	„
Benzoic ether	½	„
Formic ether	½	„
Oenanthic ether	½	„
Tinct. orris	4	„
Vanillin 1 p.c. solution oil of bitter almonds free from prussic acid	4	„
Oil of lemon terpeneless	3	„

Essence of Raspberry	1	oz.
Alcohol 95 p.c. to make	½	gal.

Mix.

VANILLA ESSENCE

Vanillin	7	oz.
Coumarin	1	,,
Cane sugar	8	,,
Rect. spirit	3	gals.
Distilled water to make	10	,,

Caramel colour to suit.

Dissolve the vanillin and coumarin in the spirit, next dissolve the sugar and the water, and mix. Filter, if necessary.

ESSENCE OF BANANA

10 lbs. of fresh but not overripe bananas are peeled, and only the pulp is used.

Macerate with 20 lbs. proofspirit, and after standing 3 days express of about 10 lbs. extract.

To the residue add.

Water	2	gals.
Solution of chamomile oil (1:10)	2½	dr.
Amyl butyrate	6	,,
Oil of coriander	12	,,

Distill off 5 lb. and mix with extract obtained as above. Result 15 lbs.

HANDKERCHIEF SCENT.

I.

Otto of Jasmine	1	dr.
Flora Jasmine	2	,,
Heiko Jasmine	1	,,
Otto de Rose	30	mins.
Essence Neroli	2	dr.
Essence Musk	2	oz.
Rectified spirit	24	,,

Mix.

II.

Essence Chameli	16	oz.
,, Rose	4	,,
,, Jasmine	1	,,
,, Neroli	½	,,
,, Amber	½	,,
,, Musk	½	,,

Mix and keep aside for a fortnight to mature. Then take 1½ oz. of this mixture and mix it with 24 oz. of rectified spirit.

DISTILLED WATER

Distilled water is usually prepared by distilling ordinary water with suitable precautions. For this purpose, take a tinned copper boiler furnished with a special still head and with a serpentine condenser of block tin. Pour the water into the boiler and heat to boiling. The steam issuing out of the boiler is passed through the condenser which is kept cool, whereby the steam is reconverted to water and collected in receiver. Care is necessary that the water may not boil violently, otherwise impurities will make their way along with steam. Reject the first portion of the distillate, which contains carbon dioxide and ammonium carbonate, the presence of which are recognised by the turbidity they produce in a solution of lead acetate. If the water contains magnesium chloride, add a little lime before distillation to prevent the hydrochloric acid from distilling. In this case, also reject the first portion of the distillate because it contains ammonia from the ammoniacal salts; the remainder of the distillate is pure water. It is, however, necessary to leave the last portion of the water undistilled, because certain organic substance commence to decompose yielding impure distilled water.

FIRECLAY GLAZE

4550 A.K.N., Kuhuri—Desires to have a formula of fireclay glaze.

To prepare glaze for fireclay articles first make the frit and then compound it with other ingredients to produce the glaze.

FRIT

Felspar	41	parts.
Sand	13	,,
Red lead	18	,,
Borax	16	,,
Kaolin	3	,,
Potash carbonate	1	part.
Chalk	6	parts.

Reduce to fine powders and mix. Then fuse in a crucible and drop in water. Then take out and grind into powder.

GLAZE MIXTURE

Frit	82	parts.
White lead	8	,,
Felspar	10	,,

Grind with a little water and apply over the fireclay articles and burn in a kiln as usual.

PAPIER-MACHE

4615 D.A., Kandulus—Desires to know a process of making papier-mache and also formulas of boot polish and sole polish.

I.

	parts by weight.
Pulp	12
Rosin size	22
Flour	11
China clay	11
Water	44

II.

	parts by weight.
Pulp	33
Starch	9
Clay	9
Water	49

Take the pulp in a suitable container pour the water, and add the adhesive and mix. Next add the remaining ingredients and incorporate to the consistency of mortar. The mixing is, of course, performed by means of a kneading machine.

The mass is then pressed in moulds or built up and shaped with a spatula to any desired form; but in the latter case a little only can be done at a time between repeated dryings. For white papier-mache all the materials should be absolutely white, and parchment size or gelatine should be used; but for coloured papier-mache, glue size can be employed. The pulp can be coloured by any mineral pigment, as lamp black, ochre, etc., or may be tinted with aniline dyes. The pressed article should be dried up slowly, or they will not keep their shape. Finally the papier-mache is coated with varnish.

Papier-mache for its weight is an exceedingly tough, strong durable substance, possessed of some elasticity, little subject to wrap or fracture and unaffected by damp. For the finest class of work, such as trays, snuff boxes, and other similar articles, sheets of paper are pasted and powerfully pressed together, so as to acquire, when dry, the hardness of board, and yet to admit, while moist, of curvature and flexture; they are afterwards carefully covered by Japan or other varnishes.

SOLE POLISH

Melt together 5 parts of stearine and 1 part of white beeswax. The mixture will be found admirably adapted for polishing shoe soles. A little of the composition should be cut off and rubbed into the sole and the latter afterward polished with a clear rag.

BOOT POLISH

Beeswax	2½ lbs.
Shellac wax	1½ „
Caustic soda lye 4°Be	8 fl. oz.
Turpentine oil	8 pints.
Nigrosine, oil soluble	1½ oz.

Shred the waxes and melt them together on a water bath. Add the caustic soda lye and stir until saponification is complete and the mass becomes homogeneous. In the meantime dissolve the nigrosine in turpentine oil warmed to 125°F in a separate vessel. Now mix thoroughly when the former is still tepid warm. Continue stirring until the temperature falls down somewhat. The mass should be put into suitable boxes when it reaches honey-like consistency in cooling down. The above is the formula of preparing black polish. For other shades dispense with nigrosine and use sufficient quantity of the following oil soluble colours such as Sudan Brown for brown; waxoline mahogany for dark tan, Bismark brown and Phosphine scales for ox-blood.

NICKEL PLATING

4621 S.E.W., Shimoga—Desires to know a process of nickel plating small articles.

In order to nickel plating articles of iron, brass, etc. first prepare the nickelling bath and then proceed as under:—

The nickel bath is prepared according to the following formula:—

Nickel and ammonium sulphate	10 parts
Boric acid	4 „
Distilled water	175 „

A sheet of nickel is used as an anode.

Perfect cleanliness of the surface to be coated is essential to success. With nickel especially in this case, traces of oxide will cause it to show dark streaks. Finger marks will in any case render the deposit liable to peel off.

Cleansing is generally accomplished either by boiling in strong solution of potassium hydrate, or, when possible, by heating to redness in a blow-pipe flame to burn off any adhesive grease, and then soaking in a pickle of dilute sulphuric acid to remove any oxide formed during the heating. In either case it is necessary to subject the article to a process of scratch brushing afterwards; that is, long continued friction with wire brushes under water, which not only removes any still adhering oxide, but renders the surface bright.

To certain metals, as iron, nickel and zinc, metallic solution do not readily take place; this difficulty is overcome by first coating them with copper in a bath composed as follows:—

Potassium cyanide	2 parts.
Copper acetate, in crystals	2 „
Sodium carbonate, in crystals	2 „
Sodium bisulphite	2 „
Water	100 „

Moisten the copper acetate with a small quantity of water and the sodium carbonate dissolved in 20 parts of water. When reaction is complete, all the copper acetate being converted into carbonate, add the sodium bisulphate, dissolve in another 20 parts of water; lastly, add the potassium cyanide, dissolved in the remainder of the water. The finished product should be a colourless liquid.

[T]EA BLENDING

4630 M.B.T., Alleppey—Wants to have the nethod of blending tea.

Blending tea is a very important factor in ea business. It depends to a great extent upon he selection of a number of different varieties of tea and mixing them in some definite proportions. But a blend suitable for general purposes is, as a rule, composed of several different varieties of Ceylon and Indian teas. The process may be successfully carried out by selecting a number of teas from different districts and studying their various peculiarities, such as the appearance and size of the leaf, the colour, liquor, flavour strength, infused leaf and creamy capacity. It must not be forgotten o "nose" each tea, both before and following infusion. Prior to definitely deciding upon ariety of tea and the proportion to use in the lend, the chief considerations must be the price hat it is to cost the use to which it is to be ubmitted, if the tea will receive careful brewng, or whether crude and hasty methods will used, and if it is to be served in pots or urns r both, and if when the blender is more exerienced the all important question of the ater conditions prevailing in the district to hich it is to be sent.

The following scheme will to an extent help maintain a continuity of character. Proure, say, 4 different varieties of tea such as ree distinct Indians and one Ceylon, the cost rice respectively of the Indians being 8 As., 3 As., and 11 As. 6 P. and of the Ceylon 15 As. P. After experimenting, it may be found that e best result is obtained by using equal quanty of each tea. In such a case, proceed as llows :—

	As.	P.
No. 1 Indian, cost	8	0
No. 2 „ „	13	0
No. 3 „ „	11	6
No. 4 Ceylons „	15	6
Average cost „ ...	12	0

When the lot has been sold, it will be ecessary to prepare another; but if it is found at the stock of one or more of the component arts has in the meantime been exhausted, en set out details of the blend as before, ppropriating the same teas as far as possible. will now be essential to fill up the gaps from ock. Take standards of the lots sold and refully match them from teas available.

		As.	P.
No. 1 Indian cost	...	8	0
No. 2 „ „	Exhausted ...	13	0
No. 3 „ „	...	11	6
No. 4 Ceylons „	...	15	6

To find an exact substitute for the Indian 13 As. may present difficulties, but it may found that by mixing in equal proportion o kinds of tea one costing 10 As. 6 P. and e other 15 As. 6 P. a satisfactory result can obtained at the same cost. The main idea to guard against all the component teas running out at the same time.

The examples given above illustrate the ethod when a blend is composed of only a few teas, but, of course, the same scheme is carried out when every lot is different.

SCENTED BETELNUT CHIPS

4634 J.B., Bellary—Wishes to have formulas of perfuming betelnut chips.

Pulverise several betelnuts. Then mix with sufficient quantity of glycerine so as to moisten the powder. Next add a little pink colour, which should, of course, be harmless. Lastly add a small amount of menthol, eucalyptus oil, etc., to perfume the substance as delicately as possible.

COFFEE TABLETS

Fresh cow's milk	20	lbs.
Water	6	„
Coffee	24	oz.
Sugar	6	lbs.

Dilute the cow's milk with the water. Infuse the mixture with 24 oz. of any good coffee. Boil gently over a mild fire for a few minutes and then strain. Add to the filtrate the refined sugar and thicken it by boiling down. Stir continually until it is pasty and then pour into a buttered mould of tin. Allow to cool and solidify and then cut into pieces of desired size and weight. They should be immediately canned into tin pots without touching by hands. To use these tablets subsequently dissolve cube in a cup of hot water and drink.

VELLUMS

4637 R.D.B., Agmala—Wishes to know the method of making vellums.

This is a species of parchment made of the skins of abortives, or making calves: it has a much finer grain, and is white and smoother than parchment, but is prepared in the same manner, except its not being passed the lime-pit. The article is used for binding superior books, and covering of drum heads.

DEPILATORY CREAM

4649 S.N., Delhi—Wants to have formulas of depilatory cream; office paste, and milk powder.

Barium sulphide	4	oz.
Petrolatum	20	„
Spermaceti	10	„
Stearin	7	„
Tinct. Iodine	1½	„
Potassium carbonate	1½	„
Water	40	„
Lavender or citronella oil	1	„

Melt the petrolatum, spermaceti and stearin over water and stir into it potassium carbonate dissolved in the water. Then incorporate the barium sulphide, tinct. iodine, and essential oil.

OFFICE ADHESIVE

A	Dextrin, white	200	parts.
	Water	200	"
B	Boric acid	2	"
	Glycerine	5	"
	Water	20	"
C	Thymol (10 % alcohol solution)	½	part.

Dissolve (A) at 90°C., add (B), and, ultimately (C) as preservative.

MILK POWDER

In this system of drying, milk is sprayed into a chamber of hot air. The minute units of the finely divided milk readily give up the moisture to the air and deposit on the sides and bottom of the hot air chamber in the form of snow-like dry milk flakes.

In this process the fluid milk is dried with or without precondensing, but any previous concentration of milk very materially increases the rapidity of drying. Most of the precondensing is done by the use of the vacuum pan or similar standard milk condensing equipment. It can however be most economically done by passing the hot air escaping from the drying chamber through a preliminary spray of the fluid milk before that milk reaches the drying chamber.

To produce the sprays the milk is forced under high pressure through one or through a series of very fine spray nozzles. Sometimes when the spray is produced by centrifugal force, the milk flows in a thin film over a rapidly revolving disc and is thrown to the walls of the drying chamber. Spraying is carried on successfully by the Stauf Patent Process. The machine consists of vertical drying chamber into which the liquid milk to be desiccated is sprayed through jets under pressure, into a fine spray. A current of heated air is admitted at the bottom of the drying chamber. This runs in the same direction as the spray of milk and evaporates the watery constituents of the spray. The steam and dried particles are carried upward by the heated air, retaining the atoms momentarily in the current of hot air and causing them to surrender substantially all the remaining moisture in the form of vapour. The vapours and dried atoms are guided by a cone extending downward from the top into the drying chamber, into collecting chambers. There the desiccat[ed] milk or dry powder gathers in hoppers aw[ay] from the vapouring current. The moistur[e] laden air is separated from the dry powder an[d] escapes through the sides of the collectin[g] chamber. It is important that the dried mil[k] should be removed from the hot dryin[g] chambers promptly so as to retain the valuab[le] properties of the original milk as much a[s] possible. For this purpose the chamber i[s] furnished with a mechanical carrier to remov[e] the dried milk product automatically as fas[t] as it is formed.

ALUMINIUM POWDER

4658 O & P., Howrah—Desires to know [a] process of making aluminium powder.

Aluminium foil is ground with

Paraffin wax	3	lbs.
Stearic acid	1	lb.

This amount is sufficient for about 105 lbs of aluminium.

VERMILION

4668 M. L. S. H., Hoshiarpur—Wants to have formulas of preparing vermilion, solid phenyle, and amla hair oil.

Red lead	8	lbs.
Zinc oxide	5	"
Venetian red	1	lb.
Vermilion dye	2	lbs.

Macerate these ingredients thoroughly in a stone mortar and set aside for 24 hours in a cool place. Finally reduce it to fine powder and pack.

SOLID PHENYLE

Tallow	7½	lbs.
Rosin	1½	"
Light creosote oil	9	"
Naphthalene	1	lb.
Caustic soda	1	"
Water	2½	lbs.

Melt the tallow and rosin in a cast-iron pan. In a separate vessel dissolve the caustic soda in water.

Now add the creosote in the melted tallow and slowly stir in the caustic soda solution When jelly-like mass is obtained remove the pan from the fire and incorporate the naphthalene in the form of fine powder. Spread the mass uniformly on a stone table and allow to harden. Then cut it into small cubes with a knife.

AMLA HAIR OIL

Take 2½ seers of sesamum brayed to a paste, 5 seers emblic myrobalan free from seeds and bruised, and 10 seers sesamum oil. Put the three ingredients together in an iron vessel and place in the sun for one month. Strain out only 5 seers of the soaking oil and put in a fresh lot of 5 seers sesamum oil. Leave aside for one month ; strain out again 5 seers of oil and put in a third and fresh lot of 5 seers of oil. Repeat the operation for 6 months. Then strain the whole of the oil and mix together the former quantities. Put in a covered vessel.

Amla oil prepared in this way serves as a good hair dye. Smear the head with it every day half an hour before bath. The hair will be dyed black and no grey hair will be noticeable.

HAIR REMOVING POWDER

4680 O. P., Shivpuri—Wants to have a good recipe of hair removing powder.

Strontium sulphide	32	parts.
Calcium sulphide	18	„
Starch	30	„
Talc	19	„

Mix.

ANTISEPTIC OINTMENT

4690 F. P. S., Barpali—Wishes to have a formula of antiseptic ointment.

Boric acid	1	oz.
Zinc oxide	1	„
Soft paraffin	6	„
Hard paraffin	2	„

Melt, mix, and stir till cold.

BLUEING GUN BARRELS

4708 M. H., Natore—Wants to have a process of blueing gun barrels and also gun oil.

To blue gun-barrels, etc., dissolve 2 parts of crystallized chloride of iron ; 2 parts solid chloride of antimony ; 1 part gallic acid in 4 or 5 parts of water ; apply with a small sponge. and let dry in the air. Repeat this two or three times, then wash with water, and dry. Rub with boiled linseed oil to deepen the shade. Repeat this until satisfied with the result.

GUN OIL

To lubricate gun barrels employ white bone oil or white vaseline oil of sp. gr. 0.870.

RINGWORM CURE

4722 P. N. N., Kanpur—Desires to know good recipes of ringworm cure, eczema ointment, etc.

Vaseline	8	oz.
Hard paraffin	1½	„
Chrysophanic acid	½	„
Ichthyol	1	dr.
Oil of cinnamon	10	drops.

Melt the vaseline and paraffin over a water bath and when liquid add the remaining ingredients and stir till cold.

ECZEMA OINTMENT.

Boric acid	80	gram.
Carbolic acid	1	„
Flowers of sulphur	60	„
Camphor	60	„
Ichthyol	60	„
Starch	1	oz.
Zinc ointment	1½	„

Triturate all the ingredients in a mortar until thoroughly incorporated.

SEALING WAX

Shellac	14	parts.
Rosin	24	„
Vermilion	1½	„
Barytes	14	„
Whiting	4	„
Turpentine	4	„

Melt the shellac and rosin over a slow fire, keep hot and work in the pigments. Lastly add the turpentine oil. Cast into sticks.

GLASS CLEANING POWDER

Prepared chalk	6	lbs.
French chalk	1½	„
Calcium phosphate	2½	„
Quillaia bark	2½	„
Ammonium carbonate	18	„
Rose pink	6	„

Mix the ingredients in fine powder and sift through muslin.

TABASIR

4726 J. O. C., Amritsar—Wants to have the process of obtaining tabasir.

Tabasir or banslochan is a siliceous and colloidal substance found in the interior of the hollow stems of most bamboos, chiefly Bamtasa araundinacea. This deposition is due to the disease set up by insects. There are two kinds of tabasir, viz.. kabudi (blue) and safid (white). It is largely used in medicine and is considered cooling, tonic, aphrodisiac and pectoral. It is an ingredient in many compound medicines which are given in different lung diseases, but from its chemical composition it must be quite inert.

—BRIEF QUERIES AND REPLIES

Questions of any kind within the scope of Industry are invited. Enquiries or replies from our experts will be published free of charge in serial order. Questions are replied by post on receipt of As. 8 stamps for each question. Subscribers outside India are requested to send two International Reply coupons for each question. In order to facilitate the work of Editor's Department and to help prompt action the readers are requested to send enquiries in separate letters

2243 H.S.W., Benares—In order to remove the defect of the soap use 5 p.c. sodium carbonate (washing soda).

2244 B.R.G., Ludhiana—Following is a formula of plate powder: Precipitated chalk 30 parts; kieselghur 30 parts; white rotten stone 30 parts; powdered hyposulphide of soda 22 parts. Mix well, then pass through a fine sieve. This is a good polishing powder for plated wares removing long standing tarnish, and polishing quickly.

2246 M.T.C., Imphal—Ice candy making machines may be had of Refrigeration & Air Conditioning Industries Ltd., 34, Ezra Street, Calcutta. Process of manufacturing ice candy will be found in Manufacture of Syrup and Cold Drinks published from this office, price Rs. 3-7 including postage.

2248 C.L.G., Delhi—For drawing instrument write to Binode & Co., 13, Dalhousie Square East and J. Sur & Co., 3, Dalhousie Square East; both of Calcutta. You should advertise in newspaper for securing a commercial designer.

2249 J.M., Madras—Process of manufacturing padding lacquer, rubbing oil, soldering pot etc. will appear in Formula Section in usual course.

2250 M.L., Sargodha—You may consult Kelly's World Directory published by Kelly's Directories Ltd., Ab Church Lane, London W.C.1.

2251 R.D., Agra—Dry cleaning solution and soap are used for cleaning wool, silk, etc. you may engage a chemist for manufacturing the above. For this purpose you should advertise in newspapers.

2253 R.R.S.R., Ratlam—Quince seeds may be had of Banshidhar Dutt, 126, Khengrapatty Street, Barrabazar, Calcutta.

2254 D.B.G., Maboli—Process of manufacturing acetic acid and making bone meal will appear in Formula Section in due course.

2256 K.N.S., Banaras—Following is a list of paper merchants: Bholanath Paper House, Kusum Smriti, 21, Beadon Street; Calcutta Agency, 133, Canning Street and Mukherjee Dutt & Co., 31, Jackson Lane; all of Calcutta.

2257 W.W.S., Almora—Following is the process of blueing gun barrels: Lead acetate 500 gr.; sodium thiosulphate 500 gr.; water 50 c.c. Dissolve the solid in water. To remove blue colour on gun barrels, warm the solution near its boiling point. Then immerse the gun in it. A variety of colours is obtained and as soon as the pale blue stage is reached the steel is taken out of the liquid and washed.

2259 V.F.S., Bombay—Process of manufacturing biscuits will be found in Home Industries published from this office, price Rs. 3-7, including postage. For soap manufacture you may consult Manufacture of Soap published from this office, price Rs. 4-7, including postage.

2260 B.B.A.B.S., Rangoon—Block making materials may be had of Photographic Stores and Agency Co. Ltd., 154, Dharamtala Street, Calcutta.

2261 D.A., Ahmedabad—Refer your query to Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

2264 M.P.K., Bombay—A good formula of incandescent mantle appeared in February 1949 issue of Industry.

2266 R.K.K., Kanpur—Process of manufacturing red lead will be found in Chemical Industries of India published from this office, price Rs. 3-7, including postage.

2267 S.L.S., Jubbulpore—Following is a list of match factories: Amrit Match Factory, Kargi Road, Bilaspur; Gujrat Islam Match Mfg. Co. Ltd., Kankaria Road, Ahmedabad, Esavi India Match Mfg. Co., 47, Murari Pukur Road, Calcutta and Imperial Match Co. (India) Ltd., Gwalior. Following is a list of bobbin manufacturers: Hind Bobbin Works, Anderson Road, Bulsar; Mahalaksmi Bobbin Mfg. Co., Tamarind Lane, Bombay and India Bobbin Co. Ltd., Clutterbuckganj, Bareilly.

2268 V.C.R., Rajahmundry—It is not possible to manufacture plastic on cottage industry scale. We have no book on plastic industry. An article on plastic industry appeared in December 1948 issue of Industry. For machines write to Alfred Herbert (India), Ltd., 13-3, Strand Road, Calcutta.

2269 H.S., Khargpur—Process of manufacturing ice cream will be found in Manufacture of Syrup and Cold Drinks published from this office, price Rs. 3-7, including postage.

2270 R.S., Phillaur—For labels enquire of Mukerjee & Sons, 3, Ezra Street, Calcutta; R. G. Paul & Co., 110-2, Grey Street, Calcutta.

2273 N.R.J., Honavar—For knitting machines and appliances enquire of L. Mullick, Wool House, Dharamtala Street, Calcutta.

2275 C.L.P., Colombo—Process of silvering mirror by amalgam process will appear in due course.

2278 A.A.M.E.W., Dhansura—From your letter it appears that you want a book on electro-plating. You may consult Electroplating In Practice by M. N. Mitter published from this office, price Rs. 3-7, including postage.

2279 S.K.V., Lucknow—For printing machine enquire of John Dickinson & Co., 6, Clive Row and Printing and Industrial Machinery Ltd., Windsor House, P14, Bentinck Street; both of Calcutta.

2281 K.C.N., Kanpur—From your letter we think that you wish to convert your business which is on partnership basis to a private registered company. In a private company members should not be less than two and more than fifty. Such a company restrict the right to transfer its shares and prohibits any invitation to public to subscribe for the shares and debentures of the company.

2283 B.N.D., Cachar—For slate and slate pencil making machines enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

2284 K.T.S., Bombay—Process of manufacturing slate pencils, fireworks, etc. will appear in due course.

2285 S.L.R., Ellore—For securing loan you may negotiate with Commercial Bank & Trust Ltd., 5, Linghi Chetty Street, G.T., Madras.

2286 K.B.P., Tatanagar—For mercerised yarn enquire of Ahmedabad Advance Mills Ltd., Outside Delhi Gate, Ahmedabad; Ahmed Moosa Motiwala & Sons, Kolsa Mohalla, Tamba Kanta, Pydhownie, Bombay and P. N. Mehta & Co., Cook's Bldg., 324, Hornby Road, Fort,, Bombay.

2289 N.D., Kanpur—You may take up manufacture of sugar candy, lozenge, etc. with Rs. 5000. For this you may consult Manufacture of Confectionery published from this office, price Rs. 3-7 including postage.

2290 F.C., Kalimpong—A formula of good washing soap appeared in February 1949 issue of Industry.

2291 V.N.S., Shencottah—12 mashas make 1 tola; 5 tolas make 1 chhatak and 16 chhataks make 1 seer.

2293 H.S.C., Jammu Tawi—We have no book on sheet metal industries. You may however enquire of Standard Literature Co. Ltd. 13-1, Old Court House Street, Calcutta.

2295 S.M.S., Baghdad—For textiles you may write to Apollo Mills Ltd., De-Lisle Road, Bombay; Bombay Industrial Mills Co. Ltd., Ferguson Road, Lower Parel, Bombay. For knit goods write to Borivli Hosiery Mills, 63, Champa Gally, Bombay 2 and Katrak Hosiery Works, 167, Lamington Road, Bombay 7.

2296 H.C.W., Jaipur City—For selling soapstone you may negotiate with Bharat Clay & Mineral Supply Co., Vithalbhai Patel Road, Bombay 4, and Hindusthan Mineral Products Co. Ltd., 28-29, Old Anjiwadi, Mazagaon, Bombay.

2297 S.N.S., Arrah—Your enquiry appears in Trade Enquiry columns.

2299 A.N.G., Tatanagar—It will be advisable for you to pack tea in tin cans and sell in the market. Filter the coconut oil through filter paper then pack in one pound tin.

2301 R. D. G., Lashkar—Following is a list of hardware merchants :—Bombay Hardware Mart, Chandabhoy Building, 15A, Lohar Chawl, Bombay ; Bombay Iron & Steel Co., 428, Kalbadevi Road, Bombay and Mody Brother & Co., 52, Nagdevi Cross Lane, Bombay 3.

2303 C. K. M., Madras—For confectionery machine enquire of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta. For vermicelli making machine enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

2304 T. C. D., Narayanganj—We have no book on coaltar manufacture. You may enquire of Standard Literature Co. Ltd., 13/1, Old Court House Street, Calcutta and Newman & Co. Ltd., 3 & 4, Old Court House Street, Calcutta.

2305 L. H.M., Cuttack—For mantle knitting machine enquire of W. H. Brady & Co. Ltd., Mercantile Bldg., Lall Bazar, Calcutta.

2308 V. B. L., Umreth—We have no dictionary. For dictionary you may enquire of W. Newman & Co. Ltd., 3 & 4, Old Court House Street and Standard Literature Co. Ltd., 13/1, Old Court House Street ; both of Calcutta.

2309 B. N. M., Vizagapatam—If the temperature of silvering solution is high black patches may form due to oxidation of silver. In order to remove this defect you have to re-silver the glass. Excess of ammonia will produce too much precipitate of silver hydroxide. In order to remedy this you have to boil the solution so that excess of ammonia will evaporate.

2312 R. R. S., Tatanagar—Following is a formula of imitation gold :—Copper 90 parts ; gold 2½ parts ; aluminium 7½ parts. Melt the copper and the gold in a crucible composed of refractory materials or of a mixture of unburnt fire-clay and dust of fire bricks, glass pots or seggars and when the metals are fluid aluminium is added. When not more than 2 lbs. of the alloy are made at one time the mass is kept in a fused state for half an hour, about 1¾ oz of borax being added as a flux. The melted mass is then poured into ingots.

2313 J. C. C., Bombay—For books on welding of electrode enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta.

2314 P. C., Delhi—For buckles and other fittings enquire of A. Das & Co., 3-4, Chandney Chowk, Calcutta.

2318 G. D. B., Calcutta—You may use gum arabic solution in taral alta. As regards putrefaction you may use carbolic acid.

2324 S. L. S., Mussoorie—We have no book dealing with railway claims and book keeping. Process of manufacturing looking glass will be found in Independent Careers for the Young published from this office. price Rs. 3/7/- including postage.

2325 D. K. N. S., Dharamavaram—Twist the yarn, then apply size to the twisted yarn. Thread thus treated will much improve as regards strength.

2326 J. G., Travancore—Refer your query to General Electric Co. (India) Ltd., Magnet House, Chitturanjan Avenue ; Kaycee & Co., Ltd., Bharat Bhavan, Chittaranjan Avenue ; Philips Electric Co. (India) Ltd., 2, Heysham Road and Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road ; all of Calcutta.

2330 S. M. S. B., New Delhi—Marble powder may be used in porcelain factory, paper, textile, rubber and oil refining industries.

2332 S. R. C., Baraut—Following is a list of homœopathic institutions :—Calcutta Homœopathic College & Hospital, 265, Upper Circular Road ; Dunham Homœo College & Hospital, 63, Upper Circular Road ; both of Calcutta. For learning sugar technology you may write to the Indian Institute of Sugar Technology, Kanpur. Following is a formula of ink eradicating fluid :—Citric acid 1 part ; distilled water 10 parts ; concentrated solution of borax 2 parts. Dissolve the citric acid in the borax solution. Apply to the paper with a delicate camel hair pencil removing any excess of water with a blotter. Then apply a mixture of oxalic acid and tartaric acid in equal parts, dissolved in just enough water to give a clean solution, acts energetically on most inks. For preserving fruit juice y should use sodium metabisulphite.

2333 I. N. U., Surat—See under No. 22

2334 H. C. C., Delhi—We have no b exclusively dealing with cigarette manufactu Process of manufacturing cigarette will found in Indian Tobacco and Its Preparati published from this office, price Rs. 3/ including postage.

2335 M. C., Neemuch Cantt.—Process making thymol will appear in formula sect in due course.

2337 K. P., Sarai—For safety ra pin making machine write to Baird Machin Co., Bridgeport, Connecticut, U. S. A. Th machines are not available in India at prese

2338 B. C. K., Hubli—You should calcul the cost of product of the magazine then y may fix subscription and advertisement rat We are not aware of any such journals her

2339 M. R. J., Surat—We have no b on jari manufacture. Your other query unintelligible.

2341 G. C. L., Bulsar—In manufacturi lemonade essence lemon is used ; in manuf turing ginger ale essence ginger ale and esse capsicum are used. Detailed information on subject will be found in manufacture of Sy and Cold Drinks published from this off price Rs. 3/7/- including postage.

2343 B. S. A., Patna City—Tablet maki machine may be had of Small Machineries M Co., 22, R. G. Kar Road, Calcutta.

2345 K. C., Indore—Refer your query the All India Village Industries Associati Maganwadi, Wardha, C. P.

2346 M. N. D., Nagpur—Reply to yo letter has already been sent by post.

2347 P. S. P., Tanjore—It is not possi to manufacture sugar from coconut Gurh or molasses is manufactured from pa (date) juice. You may refer your query to India Village Industries Association, Ma wadi, Wardha, C. P.

2348 B. P. L., Delhi—Pour all the oil an iron pan and place the pan over slow f When the oil is warm pour in it caustic so solution previously made. When saponificati is complete you may add salt solution for salti out soap. Now pure soap will float on the t

2351 C. I. M. A., Calcutta—We have book dealing with different uses of ice.

2352 K. P. T., Gurgaon—For ampoul write to Scientific Glass Apparatus Co., 5 Prosonna Kumar Tagore Street ; Scienti Indian Glass Co. Ltd., 6, Church Lane a National Glass Blowing Concern, 9, Nav Chand Dutt Street ; all of Calcutta.

2355 U. P., Barbigha—For rope maki machine enquire of Oriental Machinery Supp ing Agency Ltd., P12. Mission Row Extens Calcutta.

2357 S. W. C., Simla—Process of manu facturing rubber baloons appeared in Aug 1948 issue of Industry.

2358 M. C. A., Madanganj—Following is list of paper mills :—Titaghur Paper Mill

Chartered Bank Bldgs., Calcutta; Upper India Couper Paper Mills Co. Ltd., Lucknow; Deccan Paper Mills Co. Ltd., 815-16, Bhowani Peth, Poona and Girgaum Paper Mill, Girgaum, Bombay. Paper is imported by Bholanath Paper House, Kusum Smriti, 21, Beadon Street and Mukherjee Dutt & Co., 31, Jackson Lane; both of Calcutta. For glass tubes enquire of Premier Scientific Glass Co., 26-2A, Prosanna Kumar Tagore Street and Datta Glass Blowing Co., 28A, Fakir Chakravorty Lane; both of Calcutta. Your other query is unintelligible.

2359 D. B. M., Neemuch—For the particular pump required enquire of Martin & Co., 12, Mission Row, Calcutta.

2361 G. M., Calcutta—Add a few drops of nitric acid and shake it thoroughly. Now let the mixture settle; if the nitric acid becomes pink the mustard oil is adulterated but if it does not change its colour the oil is pure.

2362 N. R. R., Bangalore—You have to analyse grinding paste. For analysis enquire of B. V. Briggs & Co., Ltd., 3 & 4, Garstin Place, Calcutta. For tin printing write to National Sheet & Metal Works Ltd., 36-A, Sahitya Parishad Street and Bengal Tin Box Mfg. Co. Ltd., 1, Jadu Nath Mitter Lane, Shambazar; both of Calcutta,

2363 M. T. C., Sitarampur—For books on concrete and construction work enquire of Book Co. Ltd., 4-3B, Bankim Chatterjee Street; Das Gupta & Co., 54-3, College Street and Kamala Book Depot, 61, College Street; all of Calcutta.

2364 A. U. W. F., Rajahmundry—For lathes enquire of Heroes Engineering Works, Pal Street, Shambazar, Calcutta. For books on turning and moulding enquire of Das Gupta & Co., 54 3. College Street, Calcutta.

2365 M. C., Delhi—You may consult Illustrated Weekly of India, Times Bldg., Hornby Road. Fort, Bombay; Popular Mechanics, New York and Scientific American. New York.

2367 M. S., Lahore—There is no arrangement for imparting practical training on colouring plastic battery cell, bathing soap manufacture in Industrial Research Laboratory at present.

2369 T. N. K. S., Coimbatore—For cycles you may enquire of the following firms: Bentinck Cycle Co. Ltd., 1-2, Chowringhee Road; Bimal Bros., 1-B, Chowringhee; H. D. Nandy & Co., 50-6, Dhurrumtolla Street and Nandy & Co., P-62A, Bentinck Street; all of Calcutta.

2371 W. C. I., Delhi—For sulphocyanide of mercury enquire of Nadia Chemical Works, C44-46, College Street Market, Calcutta.

2372 A. L. L., Ceylon—For sheet metal working machine write to Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta.

2373 B. P. W., Jullundur City—Perfumes may be had of Jogo & Jerome Ltd., City Road, Manchester 15. Morney Ltd., 201, Regent Street. London W1 and Yardley & Co. Ltd., Carpenters Road, London E15.

2375 H. S. S., Bellary—Following is a list of newspapers of Burma:—Burma Review, 53-55, Surty Mansions. Barr Street, Rangoon, and Business Magazine, 569-577, Merchant Street; Rangoon. Following is a list of newspapers of Ceylon:—Ceylon Observer, Lake House, McCallum Road, Colombo; Morning Star, 4th Cross Street, Jaffna, Ceylon and Tropical Agriculturist, Peradeniya, Ceylon. Directories are published from this office and by Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta.

2376 B. K. R., Jasidih—You may consult Industry Year Book & Directory published from this office, price Rs. 15/-.

2378 S. I. A., Mokokchung—All the ingredients you require may be had of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta.

2379 B. S., Agra—Refer your query to Balmer Lawrie & Co., Ltd., Netaji Subhas Road. Calcutta.

2380 V. K. N., Mathura—Process of manufacturing camphor and camphor oil will appear in formula section in due course.

2381 H. P. C., Ondal—Bottles and corks may be had of Ananta Kumar Ghose & Co., 9, Ezra Street; Calcutta Manufacturers Agency, 19, Parsee Church Street and Continental Bottle Co., 24, Ezra Street; all of Calcutta. For labels enquire of Mukherjee & Sons, 3, Ezra Street and R. G. Paul & Co., 110/2, Grey Street; both of Calcutta.

2382 G. A. B., Delhi—You may sell rubber toys to China and Burma markets. You may also enquire of Controller of Exports, New Delhi whether there is any restriction for exporting rubber toys from India.

2384 C. L. S. C., Imphal—For playing cards write to W. Newman & Co. Ltd., 3 & 4, Old Court House Street and Thacker Spink & Co., (1933) Ltd., 3, Esplanade East, Calcutta.

2385 P. M., Chidambaram—Neem oil when boiled with caustic soda solution is freed from objectionable odour.

2387 G. V. R., Rajahmundry—For carborandum enquire of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta.

2388 M. I. Sargodha—You may consult Modern Soap and Detergent Industry By G. Martin. Process of manufacturing and designs of plants required for making glycerine will be found in the above book.

2389 M. M. I., Vaniyambadi—Following is a list of gut dealers: Ad. Meyer, 5, South Tangra Road. Calcutta; Hajee Gani Mohd. Master & Co., Mentuz Khan's Garden. Madras and Khalil-ul-Rahman & Sons, Asalatpura Street, Moradabad.

2393 T. C. O., Alleppey—Process of manufacturing bonemeal will appear in Formula section in due course. It is not possible to renovate old tea so that it will be like new tea in appearance, taste and flavour.

2394 K. N. S., Mohsa—Confectionery and bakery machines may be had of Small Machinery Manufacturing Co., 22. R. G. Kar Road, Calcutta.

2396 D. P. S., Agra—For arms and ammunition enquire of Abdoolally Noorbhoy, 248-252,

Abdul Rehman Street, Bombay 3; D. N. Biswas & Co., Dalhousie Square East, Calcutta and Manton & Co. Ltd., 13, Old Court House Street, Calcutta.

2397 R. D. G., Alwar—You may write to Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension, Calcutta for Bura making machine.

2399 T. G., Howrah—For required chemical enquire of Allied Agency, 16, Bonfield Lane, Calcutta and Nadia Chemical Works, C-44-46, College Street Market, Calcutta.

2400 K. L. D., Palong—Istambul kahi may be had of Paradise Perfumery House, 7, Colootola Street, Calcutta and Ghose Bros., 60, Ezra Street, Calcutta.

2401 D. R. B., Chaibasa—For pictures you may enquire of A. K. Ghose & Sons, 161, Lower Chitpur Road; Chaitanya Lal Dey & Co., 165, Lower Chitpur Road and H. P. Dass, C-83, Municipal Market; all of Calcutta. Picture frames may be had of Shaha & Sons, 162, Lower Chitpur Road, Calcutta. For sewing machine parts enquire of Don Watson & Co. Ltd., 19, British Indian Street and Dutta Choudhury & Co., 173-4, Dharamtala Street; both of Calcutta.

2402 R. L. P., Siwan—Reply to your queries has already been sent by post.

2403 K. T., Rajkot—Process of manufacturing colour will appear in Formula section in due course.

2404 B. M., Abohar—Price of Industry Year Book and Directory is Rs. 15.

2406 A. E. E., Urgo—You may consult our publications on industrial subjects.

2407 P. C. C., Naini Tal—Refrigerators may be had of Refrigeration & Air Conditioning Industries Ltd., 34, Ezra Street; Refrigerators (India) Ltd., 59C, Park Street, and M. S. Vernal & Co., Bharat Insurance Bldg. Chittaranjan Avenue; all of Calcutta.

2409 S. S. S., Etawah—You may consult Vedanta Kesari, Mylapore, Madras and Prabuddha Bharat, 4, Wellington Lane, Calcutta.

2410 U. I. I. C., Kanpur—For plastic machine you may enquire of Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta.

2411 J. S. Jammu—Process of manufacturing shaving soap will appear in Formula section in due course.

2412 Z. T. Y., Hyderabad—Refer your query to Lac Research Institute, Namkum, Ranchi.

2413 B. S. C., Lucknow—Process of removing stains from cloths will appear in Formula section in due course. For addresses you may write to American Trade Commissioner, 9 & 10, Esplanade Mansion, Calcutta.

2415 A. D. M., New Delhi—Following is a formula of nail polish: Celluloid in small pieces 50 parts; absolute alcohol 100 parts; amylacetate 300 parts; acetone 600 parts; spirit soluble Rhodamine 0.5 part. Clean the film and cut into small pieces. Mix the alcohol, acetate and acetone in an enamelled vessel and filter bright. To this add the celluloid pieces and shake frequently until dissolved. Warm a little to get a perfect solution. Now add colour. The product is of syrupy consisten Pack airtight.

2418 K. L. K., Urai—We have not rec ed the sample sent by you.

2420 K. N. S., Manbhum—Chemicals m be had of Calcutta Chemical Co. Ltd., 10, B field Lane, Calcutta. Complete Tailoring is of print.

2422 W. S., Kanpur—Following is a of sporting goods dealers: Cargills Ltd., 1, Pri Street, Fort, Colombo; Chand Sports Co., Chatham Street, Fort, Colombo and Diana Co., 92, Chatham Street, Fort, Colombo. aluminium circles enquire of Aluminium P duction Co. Ltd., 5, Council House Street a Aluminium Corporation of India Ltd., 9, Ne Subhas Road; both of Calcutta.

2425 S. D. C., Tirunelveli—Tin can m ing machines may be had of Alfred Hert (India) Ltd., 13/3, Strand Road, Calcutta. firm will supply you with estimate for start a factory. Gingelly oil is mainly used for h oil purpose. Process of manufacturing hair will be found in Indian Perfumes, Essen and Hair Oils published from this office, pr Rs. 3-7-0 including postage. Gingelly oil p duces only soft soap.

2426 Q. H. U., Sialkot Cantt—It is possible to manufacture cigarettes on sm scale with hand machine. Moreover, no su machine is available. For cigarette mak machine enquire of Small Machineries M Co., 22, R. G. Kar Road, Calcutta.

2427 S. P. G., Gaya—Following is a of medicine dealers: B. K. Paul & Co. Ltd & 3, Bonfield Lane, Calcutta; Medicinal Sup Ltd., 21, Synagogue Street; Dutta Brothers, Bonfield Lane; Eastern Drug Stores, Lindsay Street and British Drug Houses L Kent House, 33, Mission Row Extension; all Calcutta.

2428 M. S., Patna City—For the mach required enquire of Prabartak Commer Corporation Ltd., 61, Bowbazar Street, Calcu

2429 M. S., Lahore—We have no book bakelite and plastic industry. For machi you may enquire of Alfred Herbert (Ind Ltd., 13/3, Strand Road, Calcutta.

2430 U. U. R., Akividu—You may st porcelain industry; this line has good prosp You may go through October 1949 issue Industry which contains an exhaustive ar on pottery industry. For machines enquire Kusum Engineering Co. Ltd., 25, Swallow La Calcutta.

2431 P.S.G.M.C., Titilagarh—Process manufacturing graphite crucible, grapl grease etc. will appear in Formula section due course.

2432 P. B. B., Patiala—To communic with any querist write him with numbe initials care of Industry when your letter be duly redirected.

2433 A. L. D. R., Podanur—Address of mens Brother & Co. Ltd., is 5, Clive Bldgs. Netaji Subhas Road, Calcutta.

2437 M. L. Sargodha—Process of manufacturing hydrogenated oil will be found in Vegetable Oil Industry published from this office, price Rs. 3-7-0 including postage. You may also consult Hydrogenation of Fats and Oils by Carl Ellis. It is not possible to manufacture hydrogenated oil on small scale. For machine you may enquire of Volkart Bros., 8, Netaji Subhas Road and Marshall Sons & Co. Ltd., 99, Netaji Subhas Road; both of Calcutta.

2439 B. L. D., Sambhar Lake—Following is a list of feather merchants: H. C. Braham, 21, Hamsell Street, London E. C 1 and Irish Feather Co. Ltd., Poolbeg Street, Dublin.

2443 B. P., Lashkar—Process of manufacturing casein will appear in Formula section in due course.

2445 K. C. R., Satna—You may consult Independent Careers for the Young published from this office, price Rs. 3-7-0 including postage. For silvering mirror no machine is required.

2451 L. P., Damoh—For photo cameras enquire of Camera House, 131, Girgaum Road, Bombay, Calcutta Camera House, 39, Dharamtala Street, Calcutta and Photographic Stores & Agency Co. Ltd., 154, Dharamtalla Street, Calcutta.

2452 S. A. W., Khilos—Following is a list of hosiery manufacturers: Kalighat Hosiery Factory, 231, Rash Behary Avenue; D. N. Bose's Hosiery Factory, 36/1A, Sarkar Lane and Kapoor Hosiery Factory Ltd., 8, South Sinthee Road; all of Calcutta. Ready made garment may be had of Jagannath Pramanick & Bros., 6, Dharamtala Street, and A. Ruff Brothers, 38, Chandney Chowk; both of Calcutta.

2457 M. G. C., Bombay—Following is a formula of camphor tablets: Naphthalene white in scales 3.000 parts, camphor 1000 parts. Melt on the steambath and add to the hot mass coumarin 2 parts, mirbane oil 10 parts. Cast in plates or compressed tablets.

2458 M. B. G., Mussoorie—For starting a match factory you have to invest at least Rs. 1 lakh. Match making machines may be had of Standard Machinery Co., 86B, Netaji Subhas Road, Calcutta. As regards wood you may procure it locally. Chemicals may be had of Allied Agency, 16, Bonfield Lane, Calcutta. In this connection you may consult Safety Matches and Their Manufacture by K. C. Das Gupta, published from this office, price Rs. 5-8-0 including postage.

2460 G. J. S., Ramachandrapuram—For selling sago you may negotiate with Banshidhar Dutt, 126, Khengrapatty Street, Calcutta.

2462 T. J. V., Mombasa—You may consult How to Do Business by N. Banerjee, published from this office, price Rs. 4-7-0 including postage.

2465 G. B. A., Itarsi—You may start manufacture of penholders and lead pencils. You may also start flat files for office use.

2466 S. W. C., New Delhi—Formulas of watch clearing and watch rinsing solution will appear in Formula section in due course.

2467 P. G. D., Poona—Detailed process of electro-plating will be found in Electro-plating in Practice by M. N. Mitter published from this office, price Rs. 3-7-0 including postage.

2470 M. G. A. S., Srinagar—Hosiery goods may be had of A. Ebrahim Bros., 15, Zakaria Street; A. K. Paul & Co., 199/1, Harrison Road; A. K. Sinha, 29-30, Chandney Chowk; Bengal Hosiery, 31-32-33, Chandney Chowk; all of Calcutta.

2473 M. M. P., Calcutta—Process of manufacturing ordinary and electric tubri is given in September 1949 issue of Industry. It is not possible to manufacture tubri giving variegated lights. Ingredients should be taken in parts by weight.

2479. A. W. C. P. S., Adoni—For selling mosquito nets you may negotiate with the following firms: Ananta Charan Mallick, 167-5, Dharamtala Street; Ashutosh Soor, 2-3, Dharamtala Street and City Bedding Store, 168, Dharamtala Street; all of Calcutta.

2480 A. D. Kurnool—We are not aware of any such institution or factory where apprentices are taken and paid. You may however communicate with the following institutions: Chicago Radio Institute, 129, Esplanade Road, Fort, Bombay; Institute of Radio Technology, Jetharam Baug, Bombay No. 14 and College of Wireless and Commerce, 212, Bow Bazar Street, Calcutta.

2483 S.M.C., Bareilly—Straw obtained after extracting jute fibre is used as fuel.

2485 J.R.O., Jullundur—Collapsible tubes may be had of Metal Box of India Ltd., B2, Hide Road, Calcutta.

2486 A. A., Bombay—You may get an issue of Industry if you send 8 As. for ordinary issue and 10 annas for special issue of Industry.

2487 A.B., Delhi—Address of nurserymen and seeds merchants will be found in Industry Year Book and Directory. But the part containing only address of nurserymen and merchants is not available for sale. Following is a list of nurserymen and seed merchants: N. Cooper & Co., 21, Wellesley Road, Poona-1; Pestonjee P. Pocha & Sons, 3, Napier Road, Poona; Globe Nursery, 25, Ramdhan Mitter Lane, Calcutta and National Nursery, 46, Ramdhan Mitter Lane, Calcutta.

2489 A.N.M., Calcutta—For brick making machines enquire of Martin & Co., 12, Mission Row, Calcutta.

2490 B.L.K., Harda—Process of manufacturing fireworks will be found in Home Industries published from this office, price Rs. 3/7/- including postage.

2492 G.L.D., Damoh—Printed tin cans and tin sheets may be had of Bengal Tin Box Mfg. Co., Ltd., 1, Jadu Nath Mitter Lane, Calcutta and National Sheet and Metal Works Ltd., 36A, Sahitya Parishad Street, Calcutta.

2493 D.D., Amritsar—For homeopathic diploma write to Regal College of Physicians, 39, Neogi Pukur Lane, Calcutta 14 and International Institute, Aligarh.

—REVIEW OF BOOKS

THE PRODUCTION CRISIS by Prakash N. Agarwalla. Published by Thacker & Co., Ltd., Rampart Row. Bombay. Pages 196, price Rs. 5

With the attainment of freedom the people as well as the Government of this country are doing some hard thinking on how best to raise its standard of living. To solve this problem successfully two things should be pursued simultaneously, viz., increased production and an equitable distribution of the national wealth. The book under review is mainly a discussion of the first problem. It analyses in a very elaborate manner the nature of the present crisis in production in this country and points out in detail what should be done to liquidate it. Mr. Agarwalla looks at the existing crisis in production essentially from a businessman's point of view. But he does not share the narrow prejudices of businessmen in the least. On the contrary he writes candidly and unsparingly about the defects and drawbacks of the Government's economic policy and the unscientific out-of-date methods followed by this country's businessmen. He discourages mere profit-hunting and purely speculative outlook of businessmen and urges them rightly enough to introduce in our business life a scientific and constructive outlook and to humanise relations between capital and labour. Mr. Agarwalla is a realist who would not delude others into believing that whatever is wrong on the economic front will correct itself in due course. He wants all concerned to realize the need for conscious human efforts to get things right before it is too late.

The book opens with a review of the present economic trends in the country with a particular reference to the consequences of partition and the crisis in production. The crisis of the thirties was essentially a crisis in distribution being mainly due to overproduction. To-day the main drawback is under-production and the solution of the present crisis lies in and through increased production. In the next three chapters a first rate balanced criticism is made of the Government's lack of a definite economic policy, the defects of the present taxation structure, and the discontent among both Labour and Capital. The present industrial policy of the Government has failed to find favour with both the sections who contribute to production. The author thinks that the Government's policy of appeasement of all the sections can hardly succeed in the long run.

Referring to renewed fears of Japanese competition, the author says that these are baseless because of the changed conditions in Japanese economy. The book passes in brief review the present diminishing foreign trade of India, discusses the role of foreign capital, and makes a very frank criticism of administrative inexperience, the growing menace of provincialism, and India's foreign policy of neutrality which hardly could be effective in the existing world set-up. There are many concrete instances to show that India has not quite kept true to her profession of neutrality on all occasions. It seems difficult to disagree that making a mere fetish of neutrality will not be advantageous to the country's progress towards better economic conditions. The pity of the whole thing is that, in spite of our loud reiterations of neutrality, India has got more than her due share of opprobrium from the Soviet bloc, while the rival Anglo-U.S. bloc has been repelled by it despite the fact that Delhi is still in the Whitehall team. The author draws attention to the growing sense of frustration among the common people and this is both a product of and a prelude to the deteriorating economic conditions in the country.

In the concluding portion of the book the author suggests that "it will be necessary—to declare a state of economic emergency and deal with economic problems on a basis of war-time footing". He takes up topics like Industrial Policy, Tariff Policy, Production targets, Transport, Labour Policy, Profit and Wages, Taxation, etc., and recommends the steps to be taken in order to key up the country's level of production. In certain matters he betrays a certain amount of pro-capitalist bias. For instance, he discourages direct taxation and wants the Government to get tough with labour. He pleads for additional protection for indigenous industries, but little does he care to realize the probability that Indian industrialists are apt to abuse this advantage by pushing up the prices of their manufactures to an absurd level. The gross character of the sugar scandal is at once a warning and a reminder to the Government that it has to get firm first and foremost with the Indian industrialists who seek to get on at the expense of the common consumers. Mr Agarwalla's book is undoubtedly informative and thought-provoking; it is even challenging at places; but in the final analysis Mr. Agarwalla's book is a plea for rehabilitation of an out-worn economic system so that it could get a fresh lease of life. The vituperation it directs against the Government surprisingly enough is a double-edged sword: it is likely to be relished by both the extreme right and the extreme left in this country's politico-economic set-up.

CAPITAL GOODS FROM HOLLAND. Issued by the Ministry of Commerce, Government of India.

This pamphlet issued some time last year contains a list of capital goods and equipment manufactured in Holland available for export. The manufacturers' names and addresses also are given. A very useful publication for our industrialists interested in importing machinery and equipment for developing their own Industries.

INDIAN POLITICAL PARTIES by Dr. N. V. Rajkumar. Published by The All India Congress Committee, 7, Jantar Mantar Road, New Delhi. Pages, 139, price Rs. 2/8/-.

This short but knowledgeable study of the principal Indian political parties, their aims, objectives and programmes—will be of considerable help to the readers in forming an estimate of what is now obtaining in this country's political life. It is rather disheartening to be told by Dr. Rajkumar that there are no true political parties in India, "which are yet to develop." Dr. Rajkumar admits also that our political parties are not "mass parties." As he puts it, "there is an intellectual chasm that divides our political parties from the inertia and ignorance of the masses. The Indian parties have never been of the masses, though they have attempted to lead the masses."

The introductory portion of the book deals with the party system as it obtains in the western countries. It has nothing to do with the author's main topic of discussion except to serve as a background that brings our own defects into a bold relief by contrast. The author's classification of the Indian parties into communal and non-communal ones is no doubt in consonance with the realities of this country's politics. It is, however, an encouraging recent development that India is now perceptibly emerging as a secular democracy in which no communal organization will be allowed to function as a political party.

Among the non-communal parties the pride of place goes to the Indian National Congress. Next comes the Socialist Party followed by the Communist Party and a multifarious other mushroom growths which have cropped up in recent years. Among the Communal parties, the League, the Mahasabha, the Justice Party of Madras, the Scheduled Caste Federation, etc.. are included in the study.

The author's treatment is neither wholly objective nor subjective. His work moves medially between the objective and the subjective with the result that he succeeds in blending facts with comments which make the book readable and interesting. At times, of course, the author's comments become a little vituperative. For instance, he describes the League topdogs as "fanatic leaders." The author holds a responsible office in the premier political party of the Indian Union and so he could be expected to have used a more restrained language against the Leaguers, however much the bitterness the latter might have created over the issue of partition and Pakistan.

In the concluding portion of the book the reader is given a kaleidoscopic view of the recent set-up. With the achievement of independence the Congress has ceased to be the combined front of heterogenous anti-imperialist elements within the country and has now become a full-fledged political party as it never had been formely. The Congress to-day is facing a crisis and the existence of the party is being jeopardised by the factious group-making activities of the Congressmen themselves. The author points to another danger, namely, the ascendancy of the moneyed classes who might make a bid to capture the Congress for their own ends. Commenting upon the programme of the Socialists the author rightly criticises its vagueness. He urges them "to find exact moorings before they can expect to get any following." As for the Communists, the author has a few kind words to say about their rigid discipline. All the same, the Communists to-day are out to foment lawlessness to achieve their own power-political ends. Some of the Communal organisations are now trying to stage a come-back—a phenomenon which, if allowed to grow unchecked, may spell disaster for this country's democracy towards which all eyes are turned with so much hope and eagerness.

NOTICES & REVIEWS

(Manufacturers sending specimens and samples of their products for notice and review may please note that no notice is published of medical preparations and allied substances in this sections.)

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We have receiped shirt buttons of plastic from Bharat Novelty House, P.O. Box 15, Jamnagar, Saurashtra. The buttons are of very artistic design. We wish the firm success in their enterprise.

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(To communicate with any party write to him direct with name and address given below mentioning Industry).

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2208 The Indian Agency, 41, Broadway, Post Box No. 548, Madras—Want to be put in touch with the importers of salt at Tuticorin and suppliers of Kapok.

2456 Dr. Harnam Sngh Hooja, Manager, G.E.I. Corporation, Dehra Dun—Wants to be put in touch with the suppliers of walnutwood in small size sleepers.

2488 The Golden Colour Industries, Bharthana, E.I. Ry.—Want to be put in touch with the suppliers of liquid gold both Indian and foreign.

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NTHLY MAGAZINE FOR MANUFACTURERS & BUSINESSMEN

XL. CALCUTTA, DECEMBER, 1949. No.

INDUSTRY.

A Monthly Magazine for Manufacturers and Businessmen.

Published in the first week of the month by
INDUSTRY PUBLISHERS LTD.,
22, R. G. Kar Road, Calcutta-4.

EDITORIAL CONTENTS FOR DECEMBER, 1949

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All enquiries regarding industrial or business information should be addressed to the Editor. Contributions and articles for review and notice should also be sent to him.

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Issued by Industry Publishers Ltd., Calcutta - 4.

Industry

EDITOR:
K. N. BANERJEE.

VOL. XL. CALCUTTA, DECEMBER, 1949. No. 477.

INDO-U. S. ECONOMIC CO-OPERATION

PRIME MINISTER NEHRU has repeatedly pointed out he did not undertake his tour of the U. S. A. with any specific purpose in view. But his extensive tour of this highly industrialized creditor country of the world combined with his ceaseless efforts to clarify the Indian point of view on matters economic and political, cannot but go a long way towards promoting friendly relations between India and the U. S. A.

Pandit Nehru's mission might not have anything direct to do with trade issues. But his presence in America could not but accelerate the pace of the trade talks already said to be going on. Also, in his numerous speeches in the U. S. A. he did not confine himself to politics alone, but dwelt at length on India's economic needs and pointed out how exactly the U. S. A. could help India.

As Pandit Nehru put it to the Americans, India needs from them the following things : Food, "Technical Know-how," Industrial Machinery and U. S. investments in India.

There is to-day an over-all shortage of food in this country. Despite our best attempts we have not been able to liquidate it. On the one hand food prices here are very high and on the other we have to fritter away very valuable foreign exchange, of which we have a slender resource, on our food purchases abroad. If the U. S. A. agrees to send us 1 m tons of wheat, as proposed by Pandit Nehru, we can build up a central food reserve which will be a deterrent to rising food prices.

India needs to industrialize herself, even though on the whole she is bound to remain more or less agricultural. In this task the U. S. assistance in machinery and technical skill will be highly appreciated. But goods and services to be thus given will have to be paid for in dollars. Part of this finance may be, as it already is, in the shape of dollar credits provided to us by the World Bank. But certainly India's dollar requirements cannot be met fully by these loans. The proper way out of this difficulty lies in and through the investment of private U. S. capital in this country. Pandit Nehru has done well in inviting U. S. businessmen's co-operation and in assuring them fair treatment, equal opportunity, the right to export profit and just compensation in case of nationalization.

—CURRENT TOPICS

PAKISTAN'S NON-DEVALUATION

While India has devalued her rupee in terms of dollars, Pakistan has refused to follow suit. In consequence the prices of all Pakistani goods have risen to the extent the Indian rupee has been devalued, in terms of the latter. This means henceforth we shall have to pay more for our imports from Pakistan. During the past few weeks as a result of Pakistan's non-devaluation the inter-dominion trade has practically reached a deadlock. Though Pakistan has reduced the price of her raw jute, even the revised price in terms of the Indian rupee will be uneconomic. And so the Indian jute magnates are all for continuing the boycott of Pakistan jute.

Besides jute, India used to buy raw cotton in appreciable quantities from Pakistan. But as we have a very good surplus of cotton textiles we can afford to export these to the dollar area and thus hope to earn dollars in terms of which the prices of our goods have fallen as a result of devaluation. If for some time to come we stop importing raw cotton from Pakistan, our cotton textiles industry or our export trade in cotton goods will not suffer. But the same can hardly be said of our jute industry. Already the industry is showing signs of a gradually developing crisis and partial closure of work in the mills has been resorted to. Of course, at the same time vigorous efforts are being made to key up raw jute production in the Indian Union.

The Pakistani authorities held that their decision not to devalue the Rupee was not inspired by any political motive but by the fact that Pakistan's economy is essentially rural and agricultural. She exports to the dollar area, commodities like tea, cotton, jute etc., of which she has got a monopoly. And, therefore, she did not have any justifiable reason to reduce the dollar value of her rupee. Even so, the reality facing a vast number of jute cultivators in East Pakistan to-day is that they cannot dispose of their large stocks of raw jute even though its price has been lowered. The authorities are asking them to have patience and hold on to their stocks till they are ready to come to their help with a new "master plan" of theirs. What exactly this "master plan" is, nobody can tell. But it appears from news reports that Pakistan wants to reopen trade with the Union of South Africa. She hopes to export jute to the Union and import therefrom, her requirements of coal. It is rumoured that a Pak-Soviet trade treaty is now in the offing and under the contemplated treaty Pakistan will be exchanging her raw materials for machinery from Russia on the basis of the barter system.

Pakistan, though a member of the Commonwealth, thought she could well afford not to toe the line in the matter of devaluation for two principal reasons. In the first place her exports are raw materials and agricultural commodities in which she holds a monopoly. Secondly she takes some pride in her favourable balance of trade. Even so, it will not do to ignore the important fact in this connexion that what is called Pakistan's favourable trade balance is essentially due to her trade with the Indian Union. Her balance of trade is against her with the rest of the world by 6.2 crores of rupees. It is favourable only through her trade with India by a margin of 24.70 crores, of which 65 per cent. is accounted for by raw jute alone. To-day as a result of non-devaluation India has had to stop buying raw jute from Pakistan. This will certainly affect Pakistan's "favourable balance of trade" and utimately compel her under sheer pressure of self-interest, to climb down

and reduce the value of her Rupee so as to bring it down to a level of parity with the Indian Rupee.

Out of Pakistan's refusal to devalue her currency while maintaining intact her link with the Sterling Bloc, four important conclusions emerge immediately. These are: (1) The poor people in Pakistan will be hard hit by it; (2) Pakistan's businessmen will not suffer but get an opportunity to earn substantial profits by foreign made goods; (3) Britain will gain ascendancy in Pakistan's import market; and (4) the U.S.A's influence in Pakistan's export market will increase considerably.

Let us analyse the position a little more concretely.

Reports from East Pakistan show that even at reduced prices raw jute is not selling at all. Rumours are brewing that part of the land under jute may be converted to the cultivation of rice and other crop, if Pakistani authorities fail to market the raw jute stocks now lying unsold in a satisfactory manner. As a result of the deadlock in Pakistan's trade with India, prices of many essential articles including coal, matches, mustard oil, etc., are steadily rising in Pakistan. To make matters worse, workers' wage-rates are declining. All these spell hardship for the commonfolk. As for those who have to depend on remittances from their relatives in the Indian Union, inconvenience is considerable due to the stoppage of all monetary transfers from one Dominion to the other.

The picture of Pakistan would have been different if her businessmen and trade magnates had chosen to industrialize their country which enjoys such a splendid wealth of raw materials. But they prefer only to swell their own profits by treading in imported goods and sending out raw materials to foreign countries.

Before the Pound had been devalued, 1 Pakistani Rupee was equivalent to 18 Pence. But at present 1 Pakistani Rupee =27 Pence. This means that by spending 1 R Pakistan now gets more in terms of British goods than formerly. In other words, in terms of her own currency Pakistan will have to pay less for her imports from Britain. This will give a good opportunity to Britain to boost up her imports to Pakistan.

On the other hand, Britain as well as India will have to pay more for their imports from Pakistan. But since Pakistan has kept intact the dollar value of her Rupee, the U.S.A. will have to pay less for her imports from Pakistan than, say, from India. Let us see how, 1 American Dollar is now equivalent to Rs. 5/- (Indian) and a little over Rs. 3/- (Pakistani). This means what America can buy for Rs. 5/- in the Indian Union, she can get for only Rs. 3/- in Pakistan. In consequence, the dollar area may agree to buy more raw material from Pakistan than from India.

MACHINERY FOR DISPLACED PERSONS

The Government of India placed order with Japan for machinery for cottage and small scale industries some time ago. These are meant to help refugees resettle themselves. The machineries have already started arriving. Altogether, the Government intends to buy Japanese machinery worth Rs. 14 lakhs for displaced persons. A training and work centre will be opened in Delhi shortly and Japanese technicians will arrive to train about 300 refugees at this centre. Technical officers of Provincial and State Governments also will receive training here.

WOOL EXPORTS

Leading wool merchants and the representatives of some of the Provincial

Governments met in Delhi a few weeks ago to discuss what should be done to boost Indian wool exports to foreign countries. Devaluation has provided an opportunity to increase our wool exports. India's annual production of wool at present is 54.5m lbs. out of which she exported nearly 37m lbs. in 1948-49.

The Chairman of the Conference, Mr. K. L. Punjabi took the view that the present system of exports on a consignment basis was not satisfactory. He advocated the standardisation of the quality exported in the common interests of the country and the importing areas. He cited the example of countries like Australia and New Zealand which grade and certify the quality of wool to be exported.

The spokesmen of the trade who participated in the Conference laid all emphasis on the need to increase the production of wool. As a matter of fact standardisation of quality ought to follow and not precede the realisation of this urgent objective. The quality of wool India now exports is said to be better than in the pre-partition days. But the necessity of grading cannot be ruled out altogether in as much as it may help both large and small traders to have a share in India's export trade in wool.

The scope of the Delhi Conference was limited as it did not consult the producers of wool but only the traders. It is encouraging to note, however, that the producers too will be consulted shortly in the matter, as the newspaper report says.

MOTOR CAR INDUSTRY

Towards the end of October last the ECAFE met in Singapore to discuss a number of important questions concerning the region. One of the subjects which figured prominently in the discussions was the motor car industry of India.

It is curious to note that the discussion arose out of a disparaging remark of Sir Firoz Khan Noon, the Chairman. Sir Firoz, it appears, failed to take kindly to attempts by the ECAFE region to achieve rapid industrialization and economic self-sufficiency. In this connexion he cited the example of the Indian Motor Car industry. He contended that the original plan for manufacturing motor cars in India was abandoned temporarily because it was recognized that other manufacturing countries were in a better position to meet the demand. He thought that the setting up of a motor car manufacturing industry would not prove economical in view of the heavy capital expenditure which would be required initially.

The Russian delegate held that Sir Firoz was only looking at the question on a short-term basis. It was the future which was important. When Russia first undertook the manufacture of automobiles, she too experienced considerable difficulties. But to-day she has surmounted them successfully and has come out as the second largest motor car manufacturing country in the world. These are encouraging words and India should take heart and hope that in the days to come she will put out cars to fulfil her own requirements without having to import any from abroad. Prof. B. P. Adarkar, the chief Indian delegate, appreciated the remarks of the Russian delegate and rightly decried Sir F. K. Noon's disparaging criticism as unhelpful and being "neither here nor there." According to the Professor India to-day possesses 700,000 to 800,000 cars. But in future she must have 6m to 7m vehicles in all so that there may be one car for every 50 persons. Most of the motor cars now to be seen in India are imported from abroad and a very meagre percentage of these are made in this country. But the latter are not strictly Indian

made. The one or two Indo-British combines set up in recent years actually do the work of assemblage, while parts are imported from foreign countries. In some cases, the bodies of cars are being built here.

"CHROMISING" A NEW STEEL FINISHING PROCESS

A Scottish firm, it is reported, has invented a new steel finishing process known as "chromising." This gives a stainless steel finish at much less the price required for an article fabricated of stainless steel throughout. We quote below the appropriate portion of the announcement:—

"The secret of chromising is a chemical reaction which takes place at a high temperature on the surface of articles of ordinary steel, removing atoms of iron, and replacing them with atoms of chromium. The chromium penetrates into the steel to the depth of several thousandths of an inch to form a coating of stainless steel containing 30 per cent chromium without altering the dimensions of the article. Since the stainless properties are only on the surface, the total amount of chromium used is only a fraction of that needed to make an article of sole stainless steel. The manufacturers claim that chromising withstands immersion in water for an indefinite period without rusting, is not affected by the corrosive properties of moisture and smoke in the atmosphere, and resists attacks of acids and other chemicals.

EXPORT PROMOTION COMMITTEE

Some time ago the Government of India appointed a Committee known as the Export Promotion Committee. Its main task is to suggest ways and means of reducing the effect of our adverse balance of trade on India's economy.

At present due to our adverse balance of trade we have been forced to reduce our imports somewhat drastically. This means much suffering and inconveniences on the part of our countrymen. To remove this difficulty we shall have to increase our exports substantially. That would be a positive measure while reduction of imports is nothing more than the logic of negation.

The main deterrents to the export trade are factors like high prices, indifferent quality of our manufactures, and the licensing procedure for exportable articles. It is reported that the Export Promotion Committee have recommended liberalisation of export control and limitations due to taxes of exportable articles. The Committee have also stressed the importance of improving the quality of our exportable article. The difficulties relating to the high price will be reduced to some extent by devaluation. The other drawbacks which need to be liquidated as speedily as possible, are the transport difficulties and the high rates of railway freights.

MANGANESE ORE

Manganese ore is one of India's exportable commodities. Devaluation will provide an incentive to its export to the dollar area and this will help us earn dollars we now need so badly. Manganese ore figures prominently also in the bilateral trade agreements recently concluded between India and other countries of the sterling bloc. Thus by increased exports of the ore to the dollar area as well as the sterling bloc India may find it possible to reduce the gap between her exports and imports to a perceptible extent.

During the first half of 1949 India exported 2.69 lakh tons of manganese ore including 1.82 lakh tons for hard currency areas as against 3.30 lakh tons in 1948. The target aimed at this year is 7 lakh

tons of ore. Of this 4 lakh tons will be exported to the U.S.A., over 1 lakh tons to the U.K., and the rest to other hard currency countries and countries with which India is expected to earn Rs. 5.25 lakhs as export duty including Rs. 2.50 lakhs from hard currency areas.

THE HIRAKUD DAM PROJECT

It is reported that preliminary work in connexion with the Hirakud Project is now nearing completion. The Hirakud Dam is one of the 3 Dams to be constructed under the Mahanadi Valley Multi-purpose Scheme. The Scheme received the sanction of the Central Government in June, 1948 and since then work has gone on apace. A small town has sprung up on the left bank of the Mahanadi and several miles of road have been laid. Besides opening out new transport facilities both by road and railways and providing opportunities for the production of electricity from water, the Mahanadi Dam, the biggest so far undertaken in the country, will provide ample irrigation facilities. This will enable the Province of Orissa to bring large tracts of new land under cultivation. It is expected that about 1m acres of land will be brought under the plough and this may increase Orissa's annual yield of foodgrains by 340,000 tons. When the other two dams under the Mahanadi Project are constructed, Orissa, it is hoped, will have realised her ambition of being the granary for the rest of India.

—SYNTHETIC ADHESIVES

SYNTHETIC resin adhesives have made very rapid progress since their introduction and are finding many new applications.

Four main claims are made for these glues, and they are as follows:—

(a) Resistance to moisture.

(b) Resistance to attack by fungi and bacteria.

(c) High value for strength of joint.

(d) Ease of handling.

A very definite improvement over animal and vegetable glues is shown when joints made with both types are subjected to immersion in water. It is found that the former joints come apart during immersion, when the resin joint is tested; after many weeks immersion it is often found that the wood fails and not the joint. Many of the synthetic resin joints are able to withstand testing which involves immersion in boiling water for a period of twenty-four hours.

Thus these adhesives are admirably suited to outdoor construction which involve joints exposed to variations of temperature and humidity. Small watercraft manufactured from plywood bonded with synthetic resin adhesives have given excellent service and show no deterioration at the glueline, even after years of rough usage.

Synthetic resin adhesives are found to repulse attack by fungi and bacteria. When used in connection with waterside buildings or subjected to burial underground and similar conditions conductive to mould and decay, it is found that the glueline is unaffected.

The strength of joints are often greater than the strength of the wood being bonded. Joints of amazing strength are produced when two pieces of improved wood are cemented together. In spite of the relatively high density, usually a problem for ordinary glues, it is found that wood failure occurs when subjected to test. Joints able to withstand 1 ton per sq. inch are possible with many resin glues.

Resin adhesives may be applied by all the usual methods employed for glue spreading. Wood veneers used in the manufacture of plywood, furniture, and improved wood may be coated by mechanical spreader, brushing, dipping, etc.

From the handling viewpoint, gluefilm has many advantages. It is clean in use, and enables a high degree of control to be exercised over the amount used. It is also invaluable when non-staining properties are desired.

A feature of all resin glues is the fact that very little moisture is introduced to wood which is to be bonded. It is a feature which warrants serious consideration where production is concerned. The cemented components can be passed on to the next stage with little delay due to moisture content stabilisation. This applies more especially to the cold-setting types, but applies equally to hot-setting processes.

Synthetic-resin cements may be supplied ready for use, or they may be supplied in liquid form to be used in conjunction with liquid or powder hardeners. The hardeners are supplied to suit individual requirements, and a very wide range is offered to cover the demands of the setting or curing time required.

Application may be one of several methods. The resin and hardener may be mixed together and then applied to the job on hand. This method usually utilises a slow hardener to allow time for spread-

ing and assembly into the clamps or press. Another method is to apply resin to one surface and hardener to the adjoining surface. When the two are brought into contact the cement sets in the normal way.

The advantage of this method is that the veneers treated with the hardener may be stored for a period of several days before being used.

It is essential that, after storing, all particles of dust and foreign matter are dusted off, but they must not be sanded or subjected to abrasion in any form.

A further method is to apply hardener to the surface and allow it to dry thoroughly. The resin is then applied to the same surface and brought into contact with an untreated surface and subjected to pressure.

Cements may be hot or cold setting and may be extended with rye flour or other ingredients if price is to be the criterion. Extension reduces the cost by increasing the spread of resin, but at the same time the joint loses some of its water-resistant properties. It will be found, however, that the resistance to moisture is still greater than that of vegetable and animal glues.

Thermo-plastic and thermo-setting adhesives are marketed for hotpressing processes.

Both are extensively used in the manufacture of improved wood. The thermoplastic resin adhesive has some advantages for this process. It is possible by reheating the press charge to make adjustments to the density of the finished product. It is also possible to reshape or carry out compression in one or more stages. One manufacturer is making boards of compressed wood of varying density by this method. The board is compressed to thickness in the first stage. The board is then heated under pressure, and pressure is applied to the sides to increase the density as required. It can be seen that by suitable shaping of the thicknessed board the density can be varied along its whole length.

It has been shown that the resin-type adhesives are adaptable in the extreme and that all conditions are catered for in a liberal manner.

Manufacturers have provided a wide range of products, and it is essential to follow carefully their instructions, which are issued with each consignment. Particular note must be made of the date of manufacture and the date by which the cement must be used.

In the case of gluefilm, this should not be used after twelve months from manufacture. With the liquid type this period is often much shorter.

PHENOL-FORMALDEHYDE ADHESIVES

Phenol-formaldehyde adhesives may be obtained as a gluefilm or in liquid form. They are thermo-setting and used for hot-setting or cold-setting processes.

The components to be cemented together by hot pressing are subjected simultaneously to pressure and heat. The initial heat causes the glue to flow and the pressure applied causes impregnation. Increased heat cures the resin into an infusible mass.

Curing temperature should be 290° to 300°F. Curing time at these temperatures is 3 to 4 minutes. Due allowance must be made for heat penetration; that is, heat must be applied long enough to allow it to penetrate to the glueline and maintained for a further 3 to 4 minutes.

Heat penetration will vary with the materials to be bonded and with wood will vary with the species. As a general rule 1 minute per 1/32 inch is found suitable for wood. Thus to join two pieces of

wood each ½ inch in thickness would require 16 + 4 = 20 minutes.

These figures are quoted as a guide, and experience has shown them to be suitable for most requirements. It should be borne in mind, however, that it is better to err on the generous side when estimating times. The bond is not weakened by applying temperature and pressure for longer than is really necessary. Generally speaking, the glue will withstand any temperature to which wood may be subjected.

It is, of course, necessary to keep the bonding time within reasonable limits, so that the moisture content of the wood is not reduced below a safe minimum, and so that a case-hardening effect is not produced at the surfaces in contact with the hot platen. In the manufacture of improved wood using this process, it is not usual to go above 1 inch for board thickness. When thicker blocks are required, these 1-inch units are cemented together with a cold-setting adhesive to the required thickness.

UREA-FORMALDEHYDE ADHESIVES

These adhesives are thermo-setting and are used for hot or cold-setting processes. They may be obtained in powder or liquid form, and are used in conjunction with a hardener, which may also be a liquid or powder.

The hardener, if it is liquid, may be mixed with the resin or applied to one of the surfaces to be bonded.

Numerous types of hardener are available which, when mixed or brought into contact with the resin, enable the cure to be effected in a matter of minutes or hours as desired.

Adhesives in powder form are convenient for storing and handling. They are first mixed with water in the correct proportions, and are then used in the same manner as the liquid type. It is easier to weigh out and obtain the correct proportions with this type than with the liquid type which involves weighing a viscous fluid. It is claimed that when mixed, glue in powder form is easier to spread; for many applications this is a distinct advantage.

POLYACRYLIC RESIN ADHESIVES

These adhesives are one of the newer groups that have been developed in recent years. They are resistant to water, oil, and petrol, but are inflammable. They burn in a similar manner to cellulose acetate.

A special feature is colour-free transparency, which makes them admirably suited to the manufacture of laminated glass.

Polyacrylates are used for bonding items which are liable to flexure, and polymethyl methacrylates are used for rigid constructions.

POLYVINYL ACETATES

These adhesives give good joint strength and have good ageing properties, but are not particularly resistant to moisture, acids, and alkalis. They are of the thermo-plastic type, and those having a high viscosity are used for the manufacture of oil-resisting cements.

Low-viscocity grades are used for the manufacture of paper.

A modified series of compounds is obtained by reacting with acetaldehyde. These compounds have higher softening points and viscosities. They also have better toughness and adhesive properties, but their resistance to weathering is not so good.

A further modification is obtained by reacting with formaldehyde. In this form it is being extensively used in the manu-

facture of a high grade improved wood for airscrew blades.

SYNTHETIC RUBBER ADHESIVES

A very efficient adhesive which provides a resilient bond and is able to withstand extremely low temperatures consists of rubber latex and cement fondu by weight when a thin spread is required.

A synthetic latex is available to replace the rubber latex, but it will be found that at the present stage in its development the synthetic adhesive is not able to withstand such extreme cold. Nevertheless, a useful product has been produced which should find many applications, due to its resilient nature.

—INCANDESCENT GAS MANTLES

THE fact that the introduction of solids into a non-luminous flame may cause the emission of light is common knowledge to anyone who has ever heated a platinum wire in the jet of a Bunsen burner; but between this experiment and the production of an efficient system of illumination on a commercial scale lie a long series of steps; and it is only within the present generation that the process of perfecting the incandescent gas mantle has been completed.

In 1829, Berzelius observed that oxides like thoria or zirconia emitted a brilliant light when placed in non-luminous flames; but the first practical application of the idea appears to have been made when lime-light came into use. Lime heated in an oxy-hydrogen flame gives out a brilliant light; but for ordinary illuminating purposes it was useless, owing to the fact that ordinary gas-flames are too low in temperature to produce a satisfactory radiation from lime.

The incandescent mantle industry, in its modern form, dates from 1884 when Auer (later Auer Von Welsbach) took out a patent protecting the use for illuminating purposes of fibrous materials impregnated with oxides of certain rare elements. By 1891 the incandescent mantle had become a practical possibility; but at this point the fortunes of the new industry hung in the balance. Though the supply of rare earths was then amply sufficient for the purposes of scientific investigation, it seemed doubtful whether enough material could be obtained to cope with the requirements of a commercial process. At the time when the new mode of illumination was placed on the market, the minerals upon which it depended cost over a sovereign an ounce, and, what was even more grave, they could be obtained only in small amounts, twenty or thirty pounds being a very fair find at one time in the Norwegian deposits.

The demand for incandescent mantles soon made it clear that fresh sources of supply must be found, if the process was to keep the position which it had gained; and a search for other deposits was begun. It was recalled that thorium had been detected in certain abandoned gold claims in Carolina; and soon the monazite sand of that district was found to be a new mine of rare earths. Indeed, so great were the quantities discovered there and in Brazil that the epithet "rare" ceased to bear its primitive meaning. Ceylon has also yielded a material called thorianite, which is rich in thorium oxide. Within ten years, owing to the discovery of these new sources, the price of the rare earths dropped to 2 or 3 per cent. of its original amount; and the permanency of the incandescent gas mantle industry was assured, so far as this factor was concerned.

THE TREATMENT OF MONAZITE SAND

Natural monazite sands, of course, vary in composition according to their place of origin. The percentage of the mineral monazite in the sands may vary between 2 and 60 per cent; and the remainder of the sand is valueless from the commercial point of view. Even monazite itself contains a large percentage of worthless material; for its thorium content is only 5 per cent. of the whole mass.

The raw sand contains, in addition to monazite, quantities of quartz mixed with lesser amounts of other minerals; and the exact nature of the purification process depends largely upon the kind of impurities which are present. Three main

methods of segregation are employed: (1) the wet process; (2) dry blowing; and (3) electro-magnetic separation.

In the wet process, the sand is mixed with water and the liquid is run over a vibrating table, by which means the sand is sifted out into groups according to the specific gravity of its particles. Since quartz has a density of 2.65 whilst monazite's density is 4.8 to 5.5, it will be seen that the separation of the two is not difficult. The process of dry blowing depends upon the same principle, but an air-blast is substituted for the stream of water. In the electro-magnetic method, advantage is taken of the fact that the ingredients of monazite sand are differently affected by a magnet. The sand is fed on to the top of a revolving belt and thrown from this against another travelling belt behind which a strong electro-magnet is placed. The magnetic attraction retards the velocity of certain of the sand particles while leaving others to travel forward unaffected; and by means of a series of slots leading to bins, the various constituents of the sand are roughly separated from each other.

The next stage in the concentration takes the form of "breaking," which consists in feeding the monazite, obtained as above, into cast-iron pans containing twice its weight of hot sulphuric acid (specific gravity 1.84). Heating completes the process and converts the monazite into a pasty mass. This mass is run into cold water and insoluble materials such as silica are allowed to settle to the bottom. The solution, which contains the rare earth phosphates dissolved in dilute sulphuric acid, is siphoned off from the insoluble matter. In this way a material is obtained which contains thoria and the rare earths in the proportions of 1:12.

Further concentration of the thoria is effected by taking advantage of the fact that thorium is more basic than its companions and separates before them when the solution is largely diluted or is neutralised with ammonia or magnesite. The thorium precipitated in this way is filtered off, dissolve in the minimum quantity of acid, and reprecipitated by a repetition of the process.

This leaves us with a concentrated preparation of thorium phosphate and the phosphates of some rare earth elements, from which phosphoric acid is removed.

FABRICS AND THEIR TREATMENT

Three materials have been utilised in the manufacture of mantles: cotton, ramie fibre, and artificial silk. Of these, cotton is the least satisfactory and artificial silk the best, though its cost hinders its general employment. Ramie fibre is prepared from China grass; whilst artificial silk may be obtained either from viscose or from cuprammonium cellulose.

The first step in the preparation of the mantle is the testing of the yarn from which the mantle is to be made; for the knitting is done by machinery, and the tension to which the yarn is subjected appears to have some effect upon the final product. The knitting machine is designated to produce a continuous cylindrical fabric which can be cut up into lengths as required.

Artificial silk contains no mineral matter; but both cotton and ramie fibre are contaminated with inorganic and fatty impurities which must be removed. Cotton mantles are therefore treated with dilute caustic soda solution and thereafter are washed in dilute acid. Ramie fibre is soaked for some hours in dilute acid; freed from excess acid by centrifuges; washed in pure water and dipped in dilute ammonia. A final washing in water completes the purification. By these methods, the inorganic content of the fabric is reduced to about 0,02 per cent. An ash

content lower than this is found to give poor results in the finished product. The moist fabric is dried in special ovens through which a hot-air draught passes.

The long cylinder of fabric is then placed in a special machine which cuts it into pieces of fixed length, ready for the next stage in the process.

IMPREGNATION, FIXING, AND BRANDING

The "shaping" of the mantle must now be described. In the case of the ordinary upright mantle, this is done before impregnation; whilst the inverted mantle is shaped after that process is complete. The upright mantle is reinforced at the head by a piece of cotton or ramie tulle which is stitched on; and the head so formed is drawn together into the shape seen in the ordinary mantle. An asbestos book is also attached. In the case of inverted mantles, the stitching is done with impregnated thread.

The process of impregnation is the main factor in producing a good mantle. It is found that mantles soaked in a solution of a pure thorium salt do not give results as good as those dipped in solutions containing cerium salts in addition to thorium. For example, if we take intensity of the light given by a pure thorium mantle as 20, the intensity shown by a mantle containing 99 per cent. thorium and 1 per cent. cerium is about 140. Further addition of cerium above 1 per cent. leads to a decrease in the illuminating power of the mantle. But this is not the only factor with which we are concerned. Since the mantle will be subjected to shocks, it is necessary to provide it with a skeleton capable of resisting vibration; so about 1 per cent. of other materials such as aluminium, calcium, zirconium, beryllium or magnesium is added to the impregnating solution.

The time of impregnation varies according to the material of the mantle: a few minutes suffice in the case of cotton or ramie, but artificial silk mantles require longer immersion. After the soaking is completed, the mantles are run between rollers which remove exactly the proper amount of moisture; or, in the case of artificial silk mantles, the excess solution is removed in a centrifuge.

The next stage in the process is termed "fixing". Consideration will show that the lower end of the upright mantle and the upper end of the inverted mantle are the weakest points in the structures; for it is at these places that the greatest strain will come in practice. The lower end of the upright mantle is exposed to draughts and hence is liable to fray; whilst the upper end of the inverted mantle carries the weight of the whole device when in position. These two points are therefore reinforced by an additional treatment with a solution containing such materials as aluminium nitrate, borax, or calcium nitrate; and in this way extra mineral matter is deposited at the weak spots, thus forming a stronger skeleton.

Branding the maker's name upon the mantle is accomplished by taking advantage of the fact that "didymium" salts decrease the luminosity of the thorium mixture. A solution of "didymium" nitrate is employed for the inscription which becomes visible as dark lettering on the bright ground of the mantle when in use.

BURNING, COLLODIONISING, AND TESTING

The mantles are now ready for the last steps in the process. They are shaped on wooden models and are then subjected to the action of Bunsen burners which "burn off" all the original organic material from the mantle. The heating is begun at the closed ends of the mantles, as otherwise the contraction of the fibre

under the heat would distort the shape of the fabric. This first stage in heating leaves the mantle a mere fragile structure; and in order to toughen it, high-pressure burners are brought into play which consolidate the more fusible oxides in the mantle and render the whole mass more resistant.

It is next necessary to provide some support for the ash skeleton so that it may stand the shocks of transport. This is provided by the collodionising process. In groups of forty to sixty, the mantles are dipped into a mixture of nitrocellulose and various oils. The oils are added to reduce the rapidity of combustion of the nitro-cellulose. The dipping is done by machinery; and the mantles are then dried in ovens heated by high-pressure steam. When dry, they are trimmed in a machine and are then ready for packing.

—LIMESTONE AND THEIR USES

LIMESTONES belong to the group of rocks known as Sedimentary rocks namely, those formed from material with accumulated as sediments on the bed of the sea or of lakes. Sediments such as sand and mud derived from the wasting of the land and carried to the sea by rivers give rise to rocks known as standstone, clay and shale, but limestone, in general, results from the accumulation of the shells or skeletons of animals, and of certain aquatic plants.

Animals, plants, and some sea weeds are able to extract calcium carbonate and other lime salts from the water in which they live, building it into their supporting structures, and when the organism dies, they tend to accumulate on the sea floor. If mud and sand are also being deposited, the shells mingle with those sediments, eventually giving rise to fossil-bearing clays and sandstones, but on parts of the sea floor where little or no earthy sediment is being deposited, the accumulation consists almost entirely of the limey or calcareous parts of once-living creatures. When subsequent movements in the earth's crust cause it to become part of a land area, this material is more or less compacted together as a result of the cementing action the wet calcium carbonate, which is deposited between the fragments as it dries, giving rise to the rocks known as limestone.

Limestone vary very much in character and appearance according to the nature of the material from which they were derived, and also according to the extent to which their constituents have been re-constituted as a result of the action of water percolating through the mass, dissolving calcium carbonate in one place, and depositing it in a crystalline form in another.

Some limestones contain carbonate o magnesium in addition to the carbonate o calcium and they are then called magnesian limestones or dolomitic-limestones; i the amount of magnesium present is considerable, the rock is usually termed dolomite, although strictly speaking that nam should only apply if the proportion o magnesium carbonate is 45.65 per cent Owing to certain of its characteristics dolomite can be put to uses for whicl ordinary limestone is not suitable.

Since the majority of limestones ow their origin to the accumulation of shells or other supporting parts of animals o plants, many of them still retain obviou traces of such objects and may be described as shelly limestone, coral limestone or algalimestone, according to the nature of the fossils most abundant in them, bu there are certain varieties in which characters other than the fossil contents are most conspicuous, as for example, the oolitic limestone and the chalk.

The chalk is a fine grained ligh coloured lime-stone that is dull and earthy in appearance and is soft and friable. Some varieties contain in abundance the shells of minute marine creatures (foraminifera) and the rock has been compared with the oozes that are accumulating on the floor of parts of the Atlantic ocean, but it is not likely that the chalk was deposited in water as deep as that.

Oolite limestone is composed principally of small nearly spherical bodies, and in texture it resembles the "hard roe" of fishes. The individual spheres are usually about as large as a pin head, and they consist of layers of calcium carbon-

are arranged concentrically often about a minute nucleus of sand or shell; the structure of the grains and the construction of the rock are, of course, best seen on polished surfaces or by examining thin sections of the rock.

The oolitic grains may constitute practically the whole mass of the rock, or they may form only a small part of it, the remainder being fragments of shells, together with, in many cases, an abundance of entire fossil shells. Oolitic structure may occur in limestone of all ages; in England it is best developed in the carboniferous limestone, and in certain limestones of the Jurassic System. Among the latter are the Bath stones, the Portland stone, and many other stones of economic importance.

Limestone is almost as variable in its uses as in its character as the following figures will show:—

The Economic Applications of Limestons.

Uses to which put:	Proportion of Total Output Consumed:	
	1926. %	1932. %
For making lime and cement	33.0	28.5
As a flux in blast furnaces	31.0	11.0
As road-stones and building stones	31.0	48.3
In chemical industries	2.0	9.7

The importance of limestone in the metallurgical industries can be realised from the fact that no less than half a ton of limestone is required in the manufacture of one ton of iron. The limestone is placed in the furnace with the ore and the fuel, and its principal function is to unite with the earthy constituents of the ore, such as silica and clay, forming the slag which floats on the molten iron and can be drawn off separately. For this purpose a reasonably pure limestone is needed, because the more sandy or clayey material there is available to combine with the earthy portion of the ore. The limestone also assists in removing the sulphur that may be present in the ore or in the fuel—an important factor, because sulphur is an undesirable impurity in iron and steel; metallurgical limestone has, therefore, to be free from minerals, such as pyrites, which contain sulphur.

Other properties, such as an ability to withstand the crushing effect of the material with which the furnace is charged, are also of importance, and only certain kinds of limestone are suitable for metallurgical purposes. Very similar standards are necessary in the case of limestone that is to be burnt into lime for making mortar or for agricultural use, for, if much earthy impurity is present, the burnt product instead of being pure lime in a friable condition, is partially fused, and not only tends to be hard and stony, but "slakes" very slowly and imperfectly.

The magnesium-bearing varieties of limestone—dolomites and dolomitic limestone—are valuable as a source of material for use in lining steel converters and the open-hearth furnaces in which iron is converted into steel. The dolomite rock is burnt in upright kilns or furnaces, yielding a dense hard material which is ground until the fragments are about as large as peas; tar is then added to assist in binding the material together when it is rammed in place during the construction of the hearth of the furnace. The function of the dolomite, as in the case of the lime in a blast furnace charge, is to assist in the removal of impurities such as silica, phosphorus, and sulphur, which may be present in the crude iron.

Although much softer than igneous rocks, some varieties of limestone are very tough, and since the particles produced as a result of abrasion act as additional cementing material, they make good road-stones and it will be seen that in some

years nearly one-third of the limestone quarried is used for that purpose and for building stone.

Limestones most successful as road-stones are those in which the shells remains are small or those which have undergone a certain amount of internal reconstruction owing to the solvent action of percolating water. Limestones of the latter class consist largely of irregular shaped crystalline grains, interlocking one with another after the fashion of those in an igneous rock.

A discussion of the uses of limestone as a building stone would require an article to itself, it will be sufficient to mention here that several varieties of limestone are extensively used in building houses.

Although the chemical and manufacturing industries use a comparatively small proportion of the total limestone output, it is an essential ingredient in the processes for which it is required; among these may be mentioned the manufacture of chemicals, glass, soap and paper, and also the purification of water.

In some respects limestone is one of the most useful of the commodities present in the earth's crust. The importance of the part played by calcium carbonate in the realms of nature can hardly be over-estimated; it is necessary for the growth and reproduction of plants and animals, and it is an important member of the burden of inorganic materials carried in solution in the water of springs and rivers. There is scarcely a phase of modern life in which limestone does not play directly or indirectly, a prominent part. In a country where there is no calcarious rock to determine the nature of the soil or to provide the means for its improvement, and to limestone that can be used for constructing buildings, for making mortar and cement, for metallurgical processes, or in chemical industries, the progress of civilisation must of necessity be slow and industrial developments unimportant; and pre-eminence of our own country is to a large extent due to the abundance and wide distribution of a commodity that is not only indispensable in itself, but without which other natural resources could not be utilised to advantage.

—VACUUM FREEZE DRYING

BASICALLY freeze drying, or sublimation drying, is a very simple process. It consists in freezing the material and allowing the ice to sublime in a vacuum of the order of 100-300 microns (0.1 to 0.3 mm. of mercury) at a temperature between 10°C. and 30°C. The water vapour is collected with a refrigerated condenser or by absorption in a desiccant or by direct pumping. The heat of sublimation is supplied from the body of the material undergoing drying or from the walls of the container, and in the absence of any special heating arrangement the temperature of the material may fall until the vapour pressure of the ice is so low as to reduce the rate of sublimation to a negligible value. To obviate this it is necessary to supply heat to the material at a controlled rate, taking great care that the solid never melts.

The following extract from MANUFACTURING CHEMIST will give a clear insight of this new process.

There are usually two separate stages in the process of sublimation drying. In the first, ice is sublimed from the frozen mass at temperatures well below 0°C. and about 98-99% of the total water present is removed. This corresponds approximately to the straight line portion of the drying curve, which ends at the point where the receding ice surface reaches the bottom of the layer of material. In the second stage the moisture content is reduced to less than 0.5% by allowing the temperature to rise to room temperature or even higher. This can be done quite safely because by the time the material reaches the end of the first stage it is too dry to melt when it is warmed.

During the first stage the control of the heating is very critical. If the plant is provided with efficient pumping equipment and condensers (or absorbers) the factor which controls the drying process is ultimately the supply of heat to the receding evaporating ice surface. The rate of heating must be controlled to give the highest possible water vapour pressure at the ice surface without danger of melting the material in contact with the container walls. Heat is commonly supplied either by heating elements in the shelves supporting the trays or by radiant heaters. Dielectric heating is not possible because flashover would occur at the low gas pressures used.

In the second stage of the drying process the heating is much less critical. The residual moisture is removed quite readily because of the porous nature of the dry solid.

One consequence of the high porosity of freeze dried products is that these materials tend to be very hygroscopic. With penicillin, plasma and sera which are supplied in sealed ampoules this is not a serious drawback, since these substances are usually dried in the ampoules and sealed immediately afterwards. There are grave difficulties, however, in dealing with materials such as foodstuffs, fruit juices, etc which cannot be processed in their final containers. Flosdorf proposes to overcome these difficulties by handling and packing the dried products at an elevated temperature at which the equilibrium water vapour pressure over the material is higher than the partial pressure of water vapour rooms.

FREEZE DRYING PLANT

The three essential items in any freeze drying plant are (a) a container for the material; (b) a condenser or absorption system; and (c) pumping equipment.

number of different systems have been advocated, but because of scarcity of published data on performance it is impossible to discuss the relative merits of the different arrangements except in a purely qualitative way. The lack of a completely satisfactory quantitative theory of freeze drying is a factor which hinders the rational design of freeze drying equipment.

The best type of container for the material to be dried is determined largely by the nature of the material. Antibiotics, plasma and sera are best dried in ampoules and sealed immediately after the end of the drying cycle. The ampoules can be stacked in racks in the vacuum container, which should be as simple in construction as possible to facilitate sterilisation. The ampoules filled with the required quantity of liquid are frozen either by being placed in a refrigerator or refrigerated bath, or by an autofreezing process. In the former method it is customary to rotate the ampoules about their axes during freezing in order to build up a shell of frozen material and hence produce a greater surface for evaporation. With this arrangement drying starts from a narrow central core and as the ice surface recedes the drying rate increases because of the increase of surface area.

With the auto-freezing method an auxiliary refrigerated bath is not necessary: the ampoules of liquid are placed in the vacuum container and evacuated. The rapid evaporation of water lowers the temperature until the liquid freezes. Since exposure of these solutions to low pressure invariably causes serious foaming Greaves has developed a method in which the ampoules are rotated in a low-speed centrifuge during freezing. In this way foaming is suppressed and the liquid is flung out on to one side of the ampoule where it solidifies into a thin wedge-shaped mass with a relatively large surface area.

There are many substances which cannot be dried in their final containers and in these cases it is necessary to use shallow trays standing on shelves in the vacuum container. With this arrangement prefreezing in a refrigerator is to be preferred to auto-freezing unless the nature of the material is such as to cause no trouble from foaming.

With all except the smallest and simplest freeze drying units where conduction of heat from outside the container can be relied upon to maintain the temperature of the frozen material, some form of heating must be available with thermostatic control. Radiant heaters have been used successfully as also have electric elements inserted in the shelves on which the trays stand. Heating is required not only to prevent the temperature from falling too low, but also to remove the last traces of water in the second stage of drying, when exceptionally low moisture contents are aimed at.

FREEZE DRYING PERFORMANCE

There has been very little published work on the performance of freeze drying equipment. Quite apart from scarcity of data, however, it is difficult to present an accurate picture of the potentialities of freeze drying because so many factors are involved in the process. For example, in drying materials such as sera in their final containers, usually ampoules with long thin stems, the shape of the container is often unfavourable to rapid removal of water vapour and hence the drying rate is reduced by a factor which has nothing to do with the freeze drying process per sera.

The shape in which the material is frozen will clearly have some effect on the drying rate. The ideal shape is a thin flat sheet which gives a constant drying rate during nearly the whole of the drying cycle. In shell-frozen ampoules where drying starts from a hollow central core

and spreads outwards the drying rate increases continually.

The nature of the material is another factor which affects the rate of drying. Protein solutions, for example, may take 8 to 10 times as long to dry as would be required to evaporate the same quantity of pure water under the same conditions. It might be thought that a preliminary partial concentration of the solution could be advantageously carried out by ordinary vacuum evaporation in order to reduce the amount of water to be removed by the more expensive freeze drying process. There are undoubtedly many cases where this is sound practice, but it does not necessarily follow that this is always so. The more concentrated the solution to be freeze-dried the higher will be the bulk density of the finished product, and if the pre-concentration is carried too far the dry product may not be sufficiently porous to allow rapid passage of water vapour through it.

Flosdorf has given some typical figures for the drying under average conditions of sera containing 10% solids. With the material at a temperature of $-18°C.$ the ice surface recedes at the rate of about 1 mm. per hour. Drying proceeds at a constant rate until all the ice has gone: this requires about 80% of the total drying time and removes about 95% of the total water present. In 90% of the total drying time the moisture content of the product is usually reduced to about 1% and the remaining 10% of the time is required to reduce the moisture to less than 0.5%.

In the manufacture of expensive biological and therapeutic materials the cost of drying is not an important item, and freeze drying is adopted because it achieves results which could not be obtained in any other way. In the application of this method to foodstuffs, however, cost is a major consideration. For foodstuffs the cost appears to be about 3d. per lb. of water evaporated. It is claimed that freeze drying compares favourably in cost with spray-drying at low temperatures, although it is dearer than high temperature spray-drying.

USES AND ADVANTAGES OF FREEZE DRYING

Many of the advantages of freeze drying have already been mentioned. The two most important are that the technique enables heat-sensitive material to be dried without decomposition, and gives a product which can be very readily redissolved in water. Since the moisture content can be reduced to under 0.5% the storage properties of freeze dried materials are exceptionally good.

The most important single use of freeze drying is in the manufacture of penicillin, and in fact it was the need for an efficient method of drying this material without deterioration which led to the development of the process on a large scale.

In America during the war large quantities of dried blood plasma for use on various battle fronts were prepared by sublimation drying.

Other materials which have been dried by this method include streptomycin, protein hydrolysates, hormone preparations, sera, vitamin preparation, yeast and moulds, orange juice and foodstuffs.

To-day the use of freeze drying is only justified for expensive products which cannot be dried without undue deterioration in any other way. What the future will bring it is impossible to say, but it is clear that what is badly needed is a quantitative theory of freeze drying supported by adequate experimental data. Until this is available it is difficult to see how equipment can be designed on rational grounds.

—JELLIES FROM TAMARIND SEED KERNELS

JELLIES, marmaldes, etc., have so far been dietetic luxuries in our country on account of their high cost. However, with the discovery of tamarind seed jellose, it is possible to bring them within the reach of the poor man as the jellose possesses excellent jellying properties and would be far cheaper than any of the fruit pectins.

Tamarind seed jellose forms excellent sugar jellies, with or without acids, though it differs chemically from fruit pectins, and the jellies so formed compare favourably in strength and transparency with those contained from fruit pectins. Since the jellose is a colourless, odourless and tasteless product, its addition does not, in any way, affect the natural colour, flavour and taste of fruit juices from which jellies are to be prepared. Moreover, on account of its capacity to set even without acid, it scores over the fruit pectins. For example, it can form jellies with milk and sugar in the same way as it does with water and sugar. Another advantage is in the preparation of marmalades of particularly non-acidic fruits like figs, currants and bananas, since no acid taste need be introduced as when fruit pectins are used for the purpose. Tamarind seed jellose may also be advantageously used in the preparation of products similar to fruit preserves, wherein the form of the original fruit either whole or cut, is to be retained

There are indications that the jam, jelly and marmalade manufacturers are beginning to use jellose in place of fruit pectins and, therefore, it would be appropriate if a process which helps to lower the cost of production were to be worked out. It is now suggested that an aqueous extract of the kernels may be used in place of a solution of the isolated and purified jellose. The extract can be kept without any deterioration for two days at the ordinary temperature and for a much longer period in a frigidaire. The jellies formed are, however, slightly less transparent but the reduction in the production costs far outweighs this drawback.

PREPARATION OF JELLIES.

Tamarind seed kernels (1 lb.) are crushed to small bits; and boiled with water (5 gal.) for an hour in a kettle, preferably of stainless steel, of 10 gal. capacity. The kettle may be heated directly. The contents are then discharged into a tall settling vessel, 1′ in diam. and 3′ in height. The next day the supernatant liquor from the settling vessel is siphoned into a mixing tank provided with a stirrer, mixed with infusorial earth (0.3 lb.) and then passed through a small filter-press, whereby a clear extract (c. 4 gal.) containing about 1 per cent. of jellose is obtained. Alternatively, the liquor may be filtered through a bag filter made of heavy canvas, felt or other thick cloth, but in this case the filtrate will not be so clear. The extract is then led to a steam-jacketed, stainless-steel, open kettle of 10 gal. capacity, mixed with sugar (34 lb.) and boiled with thorough mixing. The boiling may also be done in a directly heated vessel, provided proper stirring is maintained right through the operation. If an acid taste is desired, citric acid (0.5 lb.) is added. During boiling the juice is skimmed in order to remove the coagulated material, if any. The mixture is further concentrated till its density is reduced to 65° to 70°Brix. This concentration can be conveniently judged by reference to the boiling temperature of the jelly solution, which will be 8° to 9°F above the boiling point of water, that is 220° to 221°F at sea level. After the heating is

over, a suitable colour and flavouring agent are added and the solution transferred into jelly glasses and allowed to set in a cool place. If intended for storage, the jelly solution, while still hot, is filled into enamel-lined jam cans, pasteurized at 180°F for half an hour, preferably after the addition of a suitable preservative, and sealed. The yield of the jelly is abont 58 lbs.

Under the conditions described above for the extraction of the kernels, a liquor containing 1 per cent of the jellose is obtained. Should the concentration, however, be different (which can be estimated by precipitating the jellose from an aliquot part by alcohol and weighing it after drying), the amounts of the sugar and the acid are adjusted for the preparation of the jelly according to the formula, jellose: acid: sugar: 4:5:340.

PREPARATION OF MARMALADES.

A marmalade is a jelly with thin pieces of fruit suspended in it. Though oranges and lemons are the common fruits employed, other fruits can also be used.

The fruit is shredded or finely sliced, and boiled in a steam-jacketed jelly kettle with 16 times its weight of the clarified tamarind kernel extract (1 per cent concentration). Boiling is continued till the slices become tender, water being added at intervals to make up the loss through evaporation. The actual duration of heating would naturally depend upon the nature of the fruit; it may be an hour as in the case of the hard orange peels or a few minutes as in the case of the tender banana fruit. The product is then mixed with 13.5 parts of sugar and boiled with mild stirring. Concentration is continued till the boiling point rises to 220° to 221°F. Subsequent operations are just the same as in the preparation of jellies.

PREPARATION OF "JELLIED FRUIT."

These products are similar to fruit preserves, with the difference that jelly is used in place of syrup for the suspension of the fruit. The fruit should retain its form, either cut or whole, and should be crisp rather than soft. The essential operations are: (1) preparation of the fruit and (2) setting it in jelly.

The fruit is prepared as in the case of candied fruits by heating for a minute or two on successive days in syrups of progressively increasing concentration up to 65°Brix. and allowing it to get impregnated with sugar after each heating. The process is followed by drying. When ready, the fruit is placed in a suitable container, and the jelly solution, the preparation of which has already been described, is poured just to cover the fruit. On cooling, a firm jelly imbedding the fruit results.

The jelly-covered fruits may solve the problem of metallic containers to some extent. They are firm and can be packed in waxed paper cases enclosed in cardboard boxes.

—Journal of Scientific & Industrial Research.

—OXY-ACETYLENE WELDING & CUTTING

THE Oxy-Acetylene method of welding and cutting is now so well known that every work, factory or shop doing general work considers that an equipment for using the process is a necessary.

There are two types of plant used, i.e. High Pressure and Low Pressure. The terms High and Low refer to the conditions of the Acetylene gas before it is mixed with the Oxygen. The High Pressure plant necessitates the use of either dissolved acetylene or a High Pressure Generator; the use of dissolved acetylene is, however, almost universal.

With the Low Pressure Plant the Acetylene is generated from carbide in a generator, it is taken from a small storage bell which is part of the generator and which maintains a gas pressure of 3 to 8 inches of water gauge.

The choice of the system to be adopted depends entirely on the nature of the work to be done and where it is to be carried out and it will be seen from the following descriptions of typical plants of both systems, that each has its advantages.

Oxygen Cylinder
Dissolved Acetylene Cylinder
Oxygen Regulator
Dissolved Acetylene Regulator
Armoured Hose For Oxygen
Canvas Re-inforced Rubber Tube for Acetylene
Cylinder Keys for each Cylinder
Hose Clips for securing the Hoses to the connections.
High pressure Welding Blowpipe
or
Combined High Pressure Welding and Cutting Blowpipe.
Goggles
Welding gauntlet Gloves.

Other accessories are often included but the above are essential.

For carrying out the work filling rods and fluxes to suit the metal being welded are required, the size of wire or rod used depending on the thickness of the metal.

A suitable work table is advisable in a welding shop and for preparing and finishing the jobs machine tools may be necessary besides bench, vice, etc.

Where work requires to be preheated, as in the case of castings, a furnace or built up arrangement of fire bricks has to be employed and special acetylene preheating torches can be used or the heating can be done by other means depending on the facilities of the shop.

LOW PRESSURE PLANT.

In place of the cylinder of dissolved acetylene a generator is substituted as the source of supply of the acetylene and no regulator of reducing valve is needed as the gas is generated at low pressure.

The list of plant required therefore is—

Low Pressure Generator with Purifier and Hydraulic Back Pressure Valve.
Oxygen Cylinder
Oxygen Regulator
Key for Oxygen Cylinder
Armoured Hose for Oxygen
Rubber Hose for Acetylene
Hose Clips
Welding Blowpipe
or
Combined Welding and Cutting Blowpipe suitable for use with Low Pressure Acetylene.

The remainder of the tools, accessories and workshop equipment are of course the same for the High Pressure system but carbide will have to be purchased and stored in a suitable place away from moisture. An airtight tin with removable cover

is the best means of storing the carbide once the drum has been opened.

ACTION OF THE OXY-ACETYLENE BLOWPIPE.

It has been found in practice that almost equal volumes of Oxygen and Acetylene gases are consumed by a welding Blowpipe, the exact quantities used, however, vary according to the adjustment of the flame. Tables below give the approximate data for presure required. These figures are based on average materials and workmanship also the use of clean surfaces and should the work not be properly prepared the quantities given may be exceeded, whilst an expert would most likely be able to make savings on the gas consumption and also work at higher speeds. The oxygen consumption is likely to be higher when a Low Pressure plant is used owing to the fact that the blowpipe is constructed on the "Injector Principle." This means simply that the high velocity of the Oxygen passing through a jet in the interior of the blowpipe induces suction which draws in the acetylene from the bell of the generator.

WELDING WITH HIGH PRESSURE PLANT.

Thickness of metal welded.	Oxygen Pressure lb./sq. in.	Acetylene Pressure lb./sq. in.	Size of welding wire to be used.
18 gauge	15	2	1/16"..
1/16"	20	2	1/16"
3/32"	25	2.5	1/16"
1/8"	30	2.5	1/16"
3/16"	30	3.0	1/16"—1/8"
1/4"	35	3.0	1/8"
5/16"	35	3.5	1/8"
3/8"	40	3.5	3/16"
1/2"	40	3.5	3/16"—1/4"
5/8"	45	4.0	1/4"
3/4"	45	4.0	1/4"
7/8"	45	4.0	1/4"
1"	45	4.0	1/4"

WELDING WITH LOW PRESSURE PLANT.

Thickness of metal welded	Oxygen Pressure lb./sq. in.	Size of welding wire
25-19 gauge	15	1/16"
19-14 "	20	1/16"
1/16".	25	1/16"
1/8"	30	1/8"
1/4"	35	1/8"
3/8"	40	3/16"
1/2"	40	3/16"
5/8"	45	3/16"
3/4"	45	1/4"
7/8"	50	1/4"
1"	50	1/4"
1 1/4"	50	1/4"

With the High Pressure Blowpipe on the contrary the pressure of the acetylene from the reducing valve may be varied at will and consequently the ratio of Acetylene to Oxygen may be altered with facility.

OXY-ACETYLENE CUTTING.

The oxy-acetylene cutting blowpipe is really an ordinary welding blowpipe with a separate central jet through which a stream of oxygen only may be allowed to issue.

The work to be cut is first heated and then oxygen is turned on from the central jet, this oxygen unites with the hot metal and burns it away leaving a kerf a little wider than the size of the central jet. By moving the blowpipe in any given direction the kerf or cut becomes continuous and any desired shape may be obtained.

The diameter of the central jet or nozzle varies with the thickness of metal to be cut and the table below gives the various data in this connection.

DATA FOR OXY-ACETYLENE CUTTING OF IRON AND STEEL PLATES.

Thickness inches of Plate	Number of Nozzle	Oxygen Pressure lb./sq. in.	Lineal feet cut per hour
1/4	1	24	65
[illegible]	1	28	60

¼	1	32	50
	1	35	40
	2	45	25
	2	52	20
	3	60	20
	3	70	18

Until recently only steel and wrought n could be cut with the oxy-acetylene wpipe but it is now possible to cut cast n, although considerable experience is uired before this metal can be cut with tainty. Non-ferrous metals cannot be with the oxy-acetylene blowpipe.

As there are several parts of the weld- blowpipe which may be used in the ting it is a simple matter to arrange for ombination and this is done as shown he illustrations by substituting a special d in place of the welding tips and tube. is combination makes it possible to e a complete welding and cutting set compact case and at a very reasonable e and these may now be obtained for rating on either the High or Low ssure system.

)MPARISON OF THE TWO TYPES OF PLANT.

As previously mentioned the class of k and where the work is to be done ely influences the choice of a suitable : of Plant.

Work may be of 3 main classes.

(1) Repetition work carried out in a :ial shop.

(2) Occasional work carried out in :ral shop.

(3) Work carried in construction or ir work on outside premises.

In considering the best type of plant each class of work the following points ild be borne in mind.

A. LOW PRESSURE GENERATOR

(1) Carbide has to be procured and cially stored.

(2) Carbide is easily stolen from an open unused drum.

(3) The carbide left over in the generator when the work is finished may not be recoverable and consequently its value is lost.

(4) Special facilities for cleaning the generator and clearing away the decomposed carbide sludge.

(5) Unless the purifier is maintained in efficient condition the gas may be poor in quality and consequently the work suffers.

(6) Owing to the gas produced not being subject to compression or other treatment the cost per cubic foot may be lower than that for dissolved acetylene.

(7) A generator necessarily contains a quantity of water for cooling purposes and consequently its bulk renders it unsuitable for moving from place to place.

B. DISSOLVED ACETYLENE CYLINDERS.

(1) The gas in the cylinders is pure and consequently good work is always possible.

(2) Gas is immediately available and only such amount as is necessary for the work in hand need be taken from the cylinder.

(3) Gas may be stored indefinitely without waste.

(4) The cylinders are portable and may be used with safety in interiors of ships, buildings, etc.

(5) No special storage is required and there is no cleaning or accumulations of sludge to be considered.

There are doubtless many other considerations according to locality for the use of either system but from the points noted it may be inferred that (1) for repetition work in a special shop that the use of generator and the Low Pressure system is perhaps the best (2) for both other cases dissolved acetylene and the High Pressure system is to be preferred.

—PLANTING VEGETABLE CRO

THE time and method of planting seeds and plants of a particular species in the open determine to a considerable extent the success or failure of the crop. Even with good seeds or good plants satisfactory and profitable crops will not be produced unless the planting is done at the right time and in a proper manner. Attention must be given to the preparation of the soil for the seed bed, to the depth of planting, rate of planting and various other factors such as thinning and watering to insure of satisfactory stand of plants.

TIME OF PLANTING.

No definite date can be given for planting vegetable seeds and plants, because climatic conditions vary widely within relatively small areas due to differences in elevation, proximity to large bodies of water, etc. The time of planting should be determined with reference to the soil and weather conditions; to the kind of crop and to the time the produce is desired. Earliness is an important factor and most gardeners aim to plant their vegetable seeds and plants as soon as it is safe. Vegetable crops may be grouped into three classes with respect to cold resistance; (1) Hardy; (2) half-hardy; (3) tender. The hardy group includes spinach, turnip, mustard, onions, and smooth peas and seeds of those may be planted as soon as the soil can be prepared in the spring. Cabbage plants may also be transplanted at this time. Seeds and plants of the half-hardy group may be planted two or three weeks before the coming of winter. Beets, carrots, parsnips, celery, lettuce, wrinkled pas and belong to this group. The third group includes beans, sweet corn, squash, pumpkin, melons, cucumbers, tomato plants, egg plants, and pepper plants.

DEPTH OF PLANTING SEEDS.

No definite rules can be given reg ing the depth to plant seeds of va kinds. The size of the seed, the kin the soil and the amount of moistur the soil should be considered. L seeds are planted deeper than small se although it does not follow that largest seeds should be planted the d est. Beans are not usually planted deep as peas, because unlike the pea young bean plant pushes the cotyle up through the soil and if the cove is too deep they may be broken off the plant thereby injured. Small s are often merely pressed into the so covered with burlap or other sir material. On light soils such as fine or sandy loams, seeds are planted greater depth than on heavy soils. more moisture there is present in the the less the mud there is for deep plan and for this reason seeds are usu given a relatively light covering in spring.

MARKING ROWS.

Straight rows and even spacing important in growing vegetables on a mercial scale. Straight rows add to appearance and also make cultiva easier and more rapid. In spraying c with a sprayer straight rows and uni spacing are essential to good work.

Straight rows can be secured by u either a line or markers of various ki When drills are used for planting s a line should be used for the first row the marker attachment used for the mainder.

METHODS OF PLANTING.

In European countries most garde plant seeds with machine planters of s kind. Machine do the work much b

and more rapidly than is possible by hand sowing. The common seed drills open the furrow, drop the seeds, cover them and pack the soil at one operation. These drills can be regulated to sow at various rates and at the depth desired. By regulating the rate of seed-sowing thinning can be reduced to the minimum.

Sowing seed by hand is commonly practised in our country requiring too much time and labour. It would be necessary to employ a drill with advantage. A garden line or marker should be used when planting is to be done by hand in order to secure straight rows. The furrow for small seeds may be made with the rake or hoe handle, using the same kind of a motion one uses in sweeping. For large seeds the furrow may be made with the corner of an ordinary hoe; with a heart-shaper hoe; or with the plough attachment. The seeds should be distributed uniformly in the furrow. Small seeds may be sown direct from the seed packet by moving it slowly over the row and tapping it lightly with the finger. The seeds should be covered immediately to prevent loss of moisture from the soil. After covering the seeds the soil, if dry, should be firmed by trampling or by tamping with the back of the hoe. This is especially important when the soil is quite dry as it brings the seed into close contact with the soil particles and makes capillary action stronger.

RATE OF PLANTING.

Among the points to be taken into consideration in regard to the amount of seed to plant are: (1) The viability of the seed, (2) the time of planting, (3) the condition of the soil, (4) the size and vigour of the young plants and (5) the possible ravages of insects.

Seeds of low viability should be planted more thickly than those having a high percentage of germination. In order to determine the rate of sending a germination test should be made in advance. If the percentage of germination is low, or if the sprout is weak the seed should not be planted, for a poor stand of weak plants would result.

Seeds planted when the soil and weather conditions are unfavourable to quick germination should be planted at a heavier rate than when the conditions are favourable. In winter when the soil is cold, and in late summer when the soil is very dry and the weather hot the rate of sending should be heavier than when the temperature and moisture are favourable. The longer the time required for germination of any given kind of seed the heavier should be the rate of planting.

Seeds which produce delicate weak plants should be planted quite thickly to insure a good stand. Any excess of plants may be removed to prevent crowding.

THINNING.

This is an important operation when seeds are planted where the crop is to mature for more plants usually come up than are needed, and, unless some are removed, injury by crowding will result. Thinning may be made a process of selection. The weakest plant should be discarded and the strongest left to grow. By thinning a uniform stand is secured, but as this is a tedious and expensive operation gardeners try to avoid it as much as possible by planting the proper amount of seed and distributing it evenly. There is a tendency among gardeners to delay thinning too long and this results in the plants that are to be left being relatively weak. Thinning should be done as soon as there is reasonable assurance that the plants left will not be killed by un-

favourable weather conditions, or destroyed by insects which are injurious during the early stages of the plant's growth.

TRANSPLANTING.

Success in transplanting plants to the field is dependent upon good plants, good condition of the soil and doing the work in the proper manner. The plants should be wellgrown, stocky and well-hardened to withstand the changed conditions. Slender, unusually soft or succulent plants do not withstand a lower temperature than plants not hardened, but it is not so well known that hardened plants also suffer less from dry or hot weather.

The soil should be thoroughly prepared prior to transplanting. It is very difficult to set plants properly in hard, lumpy soil and plants set under these conditions are likely to be seriously checked in growth, or to become weak and die.

The best time to set plants is just before, or just after, a rain, especially if the weather is cloudy. Cool, cloudy weather is desirable because evaporation and transpiration are less under these conditions than in hot, dry weather. When it is necessary to transplant in hot, dry weather it is desirable to do the work in the late afternoon if possible in order that the plants may have time during the night to recuperate from the shock of transplanting. However with soil in good condition, plants that have been previously transplanted and well hardened can be set even during hot, dry weather without much wilting if they are taken up with a block of earth around the roots. Plants that have not been transplanted previously and are pulled from the seed bed without any soil adhering to the roots should be watered when the soil is very dry.

Plants should be set slightly deeper than they were in the seed bed. It is an advantage to set long slunder plants qui deep as this will keep them from bei whipped by the wind, and, with sor plants as the tomato roots will grow fro all the joints below the surface of the so Care must be taken not to set celery ar lettuce plants so deep that the crown w be buried.

WATERING.

A plant set in very dry soil should watered unless there is a block or ball moist soil around the roots. The wat should be applied arround the roots a the wet soil covered with dry earth prevent baking. In hand planting a lit soil is usually packed around the roo and then the water is poured into the d pression. After the water disappears t hole is filled with dry soil. The tran planting machine applies the water abo the roots and in such small amounts t the surface of the soil is not puddled.

When watering is not practicable t roots of the plant are often puddled pr to setting. This is done by dipping t roots into a thin paste made with clay water. Puddling prevents drying of t roots and also causes the soil particles adhere to them when planted. The m paste should not be allowed to dry on t roots, as this would cause injury by p venting the moist soil from coming in contact with them. The puddling shou be done just before planting or else t puddled plants covered with moist burl moist moss, straw or other material to p vent evaporation of moisture in the pas Puddling requires much less labour th watering the plants and gives quite sat factory results when properly done. Wh plants are watered after being planted is desirable to cover the moist soil w a little loose, dry earth to prevent ra drying and consequent baking and cra ing.

EFFERVESCENT TABLET

Potassium bicarbonate	2	oz.	245	gr.
Sodium bicarbonate	17	„	157½	„
Tartaric acid	3	„	367½	„
Citric acid	2	„	105	„
Sucrose	2	„	105	„

Mix the ingredients in coarsely powdered ondition. Then compress into tablets.

EAR DROPS FOR REMOVING WAX

Ether	1	fl. oz.
Chloroform	1	„
Almond oil	2	„

Mix.

ELIXIR PAPAIN AND DIASTASE

Papain	15	grm.
Diastase	15	„
Solution amaranth	3	c.c.
Compound spirit of orange	3	„
Alcohol	180	„
Glycerin	300	„
Purified talc	15	grm.
Distilled water to produce	1000	c.c.

Mix the compound spirit of orange with he alcohol, add the glycerin, talc, and 400 c.c. 'ater. Use the mixture to make paste with he papain and diastase, and allow it to macerate for 24 hours or more. Filter and add ufficient water to bring the volume well up to 000 c.c. Add the solution of amaranth.

COLD & INFLUENZA MIXTURE

Ammoniated tincture of Quinine	1	fl. dr.
Solution of ammonium Acetate	1	„
Compound tincture of cardamoms	½	„
Glycerine	½	„
Chloroform water to make	1	„

Mix.

BISMUTH ET AMMON CITRAS

Bismuth and ammonium citrate may be repared by dissolving bismuth citrate in mmonia solution, filtering, evaporating the olution to a syrupy consistence and spreading n glass plates to dry.

LIQ. BISMUTH ET AMMON CITRAS

ismuth subnitrate	70 gram.	1 oz. 175 gr.
itric acid, in powder	52 „	1 „ 17½ „
ilute solution of ammonia	q.s.	q.s.
istilled water to make	1000 c.c.	to 20 fl. oz.

Mix the citric acid and bismuth subnitrate n a c.c. (20 mins.) of distilled water. Heat the nixture on a water-bath until a small portion s completely soluble in dilute solution of mmonia. Transfer the mixture to a filter and wash with distilled water until the washings give no reaction for nitrate. Add to the washed residue just sufficient dilute solution of ammonia to dissolve it, and then add sufficient distilled water to produce the required volume.

DANDRUFF CURE

Olive oil	2	ounces.
Bicarbonate of potash	2	drams.
Solution of ammonia	2	„
Tincture cantharidine	2	„

Mix thoroughly. Rub in the scalp and the hair roots. Wash with cold water. Apply a little hair oil afterwards.

COMPOUND RESORCINOL OINTMENT

Resorcinol	60	grams.
Zinc oxide	60	„
Bismuth subnitrate	60	„
Birch tar	60	„
Petrolatum	250	„
Yellow beeswax	100	„
Wool fat	280	„
Glycerin	130	„

Mix the beeswax and wool fat in a dish or a water bath. Rub the zinc oxide and bismuth subnitrate with the petrolatum until smooth and add it to the melted mixture. Dissolve the resorcinol in the glycerin, incorporate the solution with the warm mixture, just prepared, then add the oil and stir the ointment until it congeals.

It is an excellent cure for ringworm, eczema, itches, and other skin diseases.

IODISED SARSAPARILLA

Potassium iodide	1	dr.
Ammonium carbonate	1	„
Spirit chloroform	2	„
Decoction sarsaparilla co.	5	„
Infusion gentian co.	10	„

Prepare the compound decoction of sarsaparilla in the following manner: Take Sarsaparilla cut transversely 2½ oz., sassafras root in chips ¼ oz., guaiacum wood turnings ¼ oz., dried liquorice roots bruised ½ oz., mezereon bark ¼ oz. and boiling distilled water 20 fl. oz. Digest the solid ingredients in the water for an hour, boil for 10 minutes, cool, strain and make up to 20 fl. oz. Now also prepare a concentrated infusion of gentian compound according to the direction given :—Gentian root (bruised) 4½ lbs.; boiling water q s. to cover it; infuse with occasional agitation for 2 hours, express the liquor, wash the marc with a little boiling water, evaporate to 13 quarts, when cold, strain through flannel, add rectified spirit 1 gallon and pour the mixed fluids on dried orange peel, 9 lbs. Macerate for 1 week, then express the liquor in a powerful press and filter.

—Recipes for Small Manufacturers

ARTIFICIAL LEMON CRUSH

Citric acid	1 oz.
Sugar	2 lbs.
Water	28 oz.

Dissolve and add the following, previously prepared:—

Oil of lemon	½ dr.
Tincture of lemon peel	1 oz.
Tincture of turmeric	½ dr.
Caramel	20 mins.

Shake the tincture of lemon peel with the oil of lemon occasionally for 4 hours; allow the oil to separate, decant the tincture and mix the latter with the other ingredients, and filter.

PALM CANDY MANUFACTURE

A simple method for the preparation of palm candy directly from palm juice is described (J. Indian Chem. Sec., Ind. & News Ed., 1948, 11, 147). For its manufacture, the juice collected should not have undergone any fermentation. To prevent fermentation, 1 per cent. formalin (10 c.c.) or 10 c.c. of 10 per cent. lime emulsion is added for a pitcher holding 1 litre of juice. A mixture of 10 c.c. of 1 per cent. formalin and 1 c.c. of lime emulsion has been found effective when the atmospheric temperature is above 30°C.

The juice is boiled in an iron or aluminium pan and concentrated to about half the volume. Any scum formed is removed and the concentrated juice filtered through a bed of activated charcoal (from paddy husk). It is boiled again to remove any scum that may be formed and filtered through a linen cloth or a cotton plugs. Milk (1·5) is added to the boiling juice and temperature raised to 110°C. while stirring. The thickened mass is transferred to an enamelled can containing a few palm candy crystals. The depth of the juice in the can must be at least 3" to 4". The can is kept immersed in hot water and allowed to remain for 10 to 12 days. After this period the mother liquor is drained off and the palm candy crystals can be easily scraped off. The brownish crystalline and moderately hard candy contains 93 per cent. sucrose and 1 per cent. glucose.

—JOURNAL OF SCIENTIFIC & INDUSTRIAL RESEARCH.

VARNISH AND LACQUER REMOVER

Ethylene dichloride	77.5 parts.
Alcohol	10.0 ,,
Toluol	2.5 ,,
Benzene	2.5 ,,
Cellulose acetate	2.5 ,,
Paraffin Wax	5.0 ,,

Mix.

JEWELLER'S POLISHING BARS

Refined tallow	8 oz.
Iron oxide	2 lbs.
Oxalic acid	1½ oz.

Powder the acid, mix with oxide and mould with the tallow into bars like soap. The oxide must be quite free from grit, or it may scratch valuable work. It may be prepared by calcining equal quantities of oxalic acid and iron sulphate in a crucible for about 15 minutes with a good draught.

SHOEMAKER'S THREAD WAX

Rosin	76.5 parts.
Tallow	8.5 ,,
Yellow beeswax	15.0 ,,

Melt and stir until unifom. Pour into containers at lowest possible temperature.

UNSHRINKABLE WOOL

To produce unshrinkable wool, the article after being scoured may be impregnated with following solution:—

Formaldehyde	19 oz.
Boric acid	4 ,,
Glycerin	3 ,,
Urea	10 ,,
Water	95 ,,

The wool material is then dried almost bone dry (the moisture content should not then exceed 2%) so that the urea-formaldehyde resin is formed. Excess of chemicals is then removed by a light scouring in a soap liquor and the wool is left soft and unshrinkable.

DECORATIVE SPANGLES

Starch	10 oz.
Sodium perborate	0.5 ,,
Sodium salicylate	2.5 ,,
Water	87 ,,

The sodium perborate is dissolved in the water and then the starch added. This mixture is then heated in a water jacket with continued stirring to the bursting of the starch granules, and heating continued until the mass is clarified The sodium salicylate is mixed in a small amount of water and added to the mixture thoroughly stirring the same. A smooth highly polished metallic surafce is coated with a very thin film of oil or wax and the above solution spread out upon this surface in a thin layer. It is then dried in an oven at about 180 F. after which it is easily removed from this surfaoe with a knife or razor blade. These flakes can be crushed in a mortar to the desired fineness. They scintillate like mica. If the starch plastic is coloured with water soluble dyes. or coloured pigments added including powdered aluminium or bronze, very attractive and varied novelty effects are obtained. If a sign. or design is made on any surface with an adhesive drying material, and while same is still tacky the above flakes are dusted on same, a very decorative effect is produced.

—IN THE FIELD OF INVENTION

PICK COUNTING TIME CUT BY ELECTRONIC DEVICE.

Substantially reducing the time required for pick counting, one of the textile industry newest time-saving devices, an electronic pick counter which automatically counts threads in samples of cloth, has recently been introduced in American plants. Pick counting, or "thread counting", helps determine the various types of fabrics, and is essential for such identification. As is well known, in the examination of many fabrics the accurate determination of the number of ends and picks per inch is very important

In ordinary practice, a counting glass is used for counting the threads in fabrics, a tedious and painstaking operation. By this method well over a minute of time is required even by experts to count the picks in one square inch of sheeting. The new electronic pick counter cuts counting time from minutes to seconds and, moreover, it is claimed, eliminates all chances of error. A tiny beam from a photoelectric cell passes across a couple of inches of cloth and the exact count is instantly recorded by the new device.

—TEXTILE RECORDER.

NEW HAIR COLOUR RINSE

A new colour tone hair rinse, evolved by chemists of the Demuth company after extensive research, is now being marketed. It contains a new compound, sulphamol.

Called the Spic rinse, it is a tint which washes out easily with the next shampoo, giving a more effective and brighter tint than has previously been possible, using less colouring material. Because of its sulphur content, the sulphamol compound is beneficial to the hair itself and to the scalp, while its properties dissolve any "scum" from hard water or a soap shampoo, which would otherwise tend to dull the colour of the hair and detract from its natural sheen.

Principle of its use is based on the fact that every head of hair is composed of varying shades, even black hair having some blonde strands in it. Made in six shades, the Spic rinses can be mixed, two shades or more being combined for one rinse.

Messrs. R. Demuth, Ltd., Mavins Court, Greenhill Road, Farnham, Surrey (who also make the well-known Spic shampoo) are introducing the new rinse to the public with a large-scale promotion campaign.

—CHEMICAL PRODUCTS.

MERCURY VAPOUR PUMPS

Vitreosil M.V. pumps for obtaining high vacua have been in successful use for many years. They are particularly suitable for research and routine laboratories. and. being constructed entirely of fused silica, the pumps are unaffected by corrosive vapours and possess all the remarkable properties characteristic of Vitreosil.

It will be appreciated that when using a mercury vapour pump as the final stage in an evaquating system, it is necessary to use a CO_2 snow or liquid air trap if an absolute pressure below 0.001 mm. Hg. (the vapour pressure of mercury at room temperature) is to be attained. The vitreosil pumps can achieve very low pressures of the order of 0,00002 mm. Hg., and below, under the proper conditions, that is, with a good backing pump in operation at below 1 mm.

As a result of a comprehensive examination of the performances of patterns they have made from time to time. The Thermol Syndicate, Ltd.. now offer two standard types of high vacuum pumps covering the range of performance for which more patterns were in demand.

—CHEMICAL PRODUCTS.

AMINO ACIDS AS FAT STABILIZERS

The cost of stabilizing Lard and other animal fats by means of phenolic anti-oxidants may be reduced by the use of methionine and other relatively inexpensive amino acids to synergize the activity of such costly anti oxidants as z-tocopherol, hydroquinone and nordihydroguaiaretic acid. It has been found that 0.01 per cent. of an anti-oxidant together with 0.01 per cent. of amino acid is as effective as 0.1 per cent. of the phenolic anti-oxidant alone.

With z-tocopherol as the primary phenolic anti-oxidant, the most effective synergists were found to be methionine and subcorbic acid. But with hydroquinone and nordihydroguairetic acid, methionine gives the maximum effect. Other amino acids, reported to be effective but not as effective as methionine, include thereonine, lucine, norleucine, valine and cysteine and phenylalanine.

—JOURNAL OF SCIENTIFIC & INDUSTRIAL RESEARCH.

SYRUP GLYCEROPHOSPHATES

4760 S. H., Dacca—Desires to know the formulas of preparing syrup glycerophosphates.

Calcium glycerophosphate	22.9	grms.
Magnesium glycerophosphate	11.4	,,
Iron glycerophosphate	5.7	,,
Solution of potassium glycerophosphate	22.9	,,
Solution of sodium glycerophosphate	22.9	,,
Potassium citrate	11.4	,,
Glycerophosphoric acid	20.8	,,
Caffeine	5.7	,,
Strychnine	0.2	,,
Glycerin	200.0	c.c.
Sucrose	400.0	grms.
Solution of Bordeaux B.	31.2	c.c.
Chloroform	2.1	c.c.
Alcohol (90 p.c.)	4.2	c.c.
Distilled water to make	1000	c.c.

Dissolve the potassium citrate in 350 c.c. of distilled water, add the solutions of potassium glycerophosphate and sodium glycerophosphate and dissolve the other glycerophosphates in the solution. Next add the glycerine, the strychnine dissolved in the other glycerophosphoric acid, and the caffeine dissolved in 50 c.c. (11 oz.) of hot distilled water

Filter and dissolve the sucrose in the filtrate without the aid of heat. Add the chloroform dissolved in the alcohol, the solution of Bordeaux B and sufficient distilled water to produce the required volume.

ROOMI MASTIC

Roomi mastic is a kind of resin obtained from Pistacia Leutiscus, an evergreen shrub of the Mediterranean region. The resin occurs in small, irregular yellowish tears, brittle and of a vitreous fracture, but soft and ductile when chewed.

ENAMEL PAINTS

4782 U.T.B., Bombay—Desires to know the process of manufacturing enamel paints.

10 lbs of zinc oxide, ground in linseed oil, are mixed very thoroughly with about 1 gallon of pale copal varnish; 1 pint of pale Japan gold size is added and the mixture is then thinned a little by the addition of ½ pint of turpentine oil. It is of the utmost importance to extract every particle of material which could mar the uniformity of the enamelled surface and with that object the mixture is passed through a series of three sieves or strainers, the last being of a very fine mesh. The enamel being somewhat thick, soft revolving brushes are usually employed to facilitate the operation of straining.

Although the above recipe is a practical one, as a matter of fact "stand oil" (which is a thickened linseed oil) often takes the place of the varnish, and excellent enamels are made which do not contain an ounce of gum resin.

FLAT ENAMELS

Grind 80 parts by weight of zinc oxide in a vehicle composed of 10 parts of varnish made from Kauni gum (made of only 10 gallons of oil to 100 lbs. of gum), 3 parts of palest lithographic varnish, 10 parts of pure turpentine oil. This will produce a soft paste base; let it stand for 48 hours, cover it with some turpentine to keep it from skinning over, then thin down with 24 lbs of turpentine to every 100 lbs. of paste. By grinding calcined borax in varnish or pale oil and turpentine and adding as much as constitutes ½ lb of dry borax to the above base, it will tend to make the material dead flat on drying. These flat enamels may be tinted to any desired effect with colours ground in oil, if only small proportions are required, otherwise the colours used should be ground in Japan gold size and thinned with turpentine.

MENTHOL CRYSTALS

4790 W.R.B., Kasauli—Desires to learn the formulas and process of making menthol and thymol.

Menthol is prepared by chilling the oil obtained from the fresh herb of Mentha Piperita. For this purpose put a quantity of oil in a glass beaker and then surround the bottom of the vessel with a mixture of ice and salt. As the temperature of the oil diminishes crystals of menthol collect at the bottom of the vessel, and are then taken out. Then press them in folds of blotting paper and keep in air-tight bottles.

THYMOL

Thymol is generally prepared from ajowan seeds. For this purpose a stout distilling vessel of cast-iron is fitted with a condenser and receiver. A fairly large quantity of ajowan is put into the vessel according to its capacity and a quantity of water is then poured to cover the seeds just immersed in it. On heating the oil of thyme is distilled over. It is condensed and collected in a receptacle placed in the further end of the condenser. The oil is then separated from water by decanting the upper layer.

Thymol is isolated from this volatile oil by shaking the latter with an equal volume of warm sodium hydroxide solution (sp. gr. 1.33) and

after several hours the mixture is diluted with 2-3 volumes of hot water. The aqueous portion, which contains the thymol in solution, in the form of its sodium salt, is separated and acidified. The precipitated thymol is dried and rectified by distillation. The fraction which distils at 220°-235°C is seeded with a crystal of pure thymol and set aside in a cold place. The crystallised thymol is separated by filtration and purified by recrystallisation from petrol.

WOOD STAINS

4796 C.J.D., Trichur — Desires to know process of making woodstains, such as mahogany stains, walnut stains, and oak stains.

MAHOGANY STAINS

Methylated spirit	5	gals.
Orange shellac	10	lbs.
Amber rosin	5	„
Spirit mahogany	8	oz.

Mix and keep aside to dissolve. Then strain with a cloth.

WALNUT STAINS

Strong Vinegar	1	gal.
Dry burnt umber	1	lb.
Fine rose pink	½	„
Dry burnt vandyke brown	½	„

Mix and set aside for a day. Then strain with a cloth. Apply with a sponge.

OAK STAINS

Methylated spirit	5	gals.
Garnet shellac	8	lbs.
Dark rosin	7	„
Spirit of oak	8	oz.

Mix.

CEMENT FOR GLASS

Isinglass	120	parts.
Water	1200	

Soak the isinglass in cold water for 24 hours, then strain and evaporate carefully on a water bath to 450 parts. Add to the warm liquid a solution of:—

Mastic	40	parts.
Ammoniacum	40	„
Rectified spirit	45	„

Complete with water to 1000 parts. On cooling the mixture solidifies and for use is liquefied by placing in boiling water. This yields an excellent cement for mending glass and porcelain.

RAT POISON

Strychnine sulphate	80	gr.
Lactose	160	„
Prussian blue	5	„
Fine biscuit meal to make	1	lb.

Place strychnine in a mortar with a little of the lactose and thoroughly grind the two together, add the Prussian blue and gradually the remainder of the lactose so as to make a perfect mixture. Lastly mix in the fine biscuit meal.

BLACK PAINT

Amber	8	oz.
Linseed oil	4	„
Asphaltum	1½	„
Rosin	1½	„
Turpentine oil	8	„

Heat the linseed oil to boiling point, add the amber, asphaltum and rosin. When well melted remove from the fire and gradually add the terpentine oil. As terpentine oil is a highly inflammable substance, it should be incorporated away from the fire.

PLASTIC MOULDING POWDER

4797 M.K., Mokabar—Desires to learn a good formula of making plastic moulding powder.

Potato Starch	200	gram.
Formaldehyde (40%)	80	c. c.
Urea	8	gram.
Water	16	c. c.
Lactic Acid	1	„ „

Mix well until uniform; then heat for 1-2 hours at 90°C in a closed vessel. Remove cake and grind to fine powder. Dry to 8 per cent. water content. To this add following solution:—

Urea	8	gram.
Formaldehyde (40%)	18	c. c.
Ammonia (25%)	4	„ „

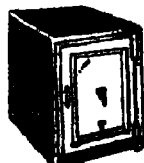
Mix well and mould under pressure.

BAKELITE STAMPING INK

Clear Printing Ink	60	c. c.
Fortifying Acid	10	„ „
Filler	15	„ „

Mix in a mortar.

To prepare fortifying acid proceed as follows:—

Hydrochloric acid	20	c. c.
Antimony trichloride	3	gram.
Bismuth chloride	3	„

Filler used in the above preparation is made by mixing the following:—

Glyceryl phthalate	5	gram.
Menthol	10	c. c.

BAKELITE TYPE RESIN

4806 A.M., Peshawar—Wishes to have a method of making bakelite type resin.

Phenol	376	gram.
Formaldehyde	450	c. c.
Ammonia (0.88)	10	,, ,,

Put the mixture in a beaker immersed in a boiling water bath for about 1½ hours. As the molecular weight of the resin increases, the clear solution becomes turbid, and finally it separates out as a liquid which solidifies on cooling. The upper aqueous layer is decanted, and the solid resin carefully melted in a porcelain basin and the water distilled off. This dehydration needs care or the molten resin will forth up. The dehydrated resin should be quite clear and set hard on cooling.

Having prepared the resin, it is interesting to try moulding it. After being ground to a fine powder, mix the resin with about 20% of wood flour and half as much hexamethylene tetramine (made by evaporating to dryness a mixture of formalin and 0.88 ammonia solution in excess). Then put the mixture in a mould and heat under pressure to a temperature of 140°-150°C. The time required for heating depends upon the length of time the resin was in the water-bath during the first stage and also upon the amount of hexamethylene-tetramine used, but it should not be more than 3 to 5 minutes.

NATURAL RUBBER LATEX PRESERVATIVE

6 K.M., Chandausi—Wishes to have good recipes of latex preservation, blue-black fountain pen ink, etc.

Addition of followng to raw latex gives satisfactory long period preservation:—

Naphthol Blue-Black	1	oz.
Gum arabic (powdered)	½	,,
Carbolic acid	¼	,,
Distilled water	1	gallon.

Stir together in a glass or enamelled vessel until dissolved.

INK TABLETS

Methylene blue	1	oz.
Methyl violet	½	,,
Dextrin	1	lb.

Mix the ingredients and then moisten with a little water. Dry in the sun and then break up in coarse powder. Finally compressed into tablets by means of a tablet making machine the mould of which may be lubricated with a little paraffin oil from time to time so that the mould remains clear.

LIQUID METAL POLISH

17 M.G.S., Aligarh—Desires to have formulas of preparing liquid metal polish and hair oil.

Naphtha	62	oz.
Oleic acid	½	,,
Kieselguhr	7	,,
Triethanolamine oleate	½	,,
Ammonia solution	1	,,
Water	1	gallon

In one container mix together the naphtha and oleic acid to a clear solution. Dissolve the triethanolamine oleate in water separately, stir in the Kieselguhr and then add the naphtha solution. Stir the resulting mixture at high speed until a uniform creamy emulsion results. Then add the ammonia and mix well but do not agitate as vigorously as before.

SCENTED HAIR OIL

Bela oil	24	oz.
Alkanet root	½	,,
Lavender	3	dr.
Bergamot	4	,,
Clove oil	½	,,
Rosemary	1	,,
Sandal	2	,,
Musk otto	½	,,

Take the bela oil and put into it the alkanet root and after 24 hours strain through a cloth and remove the alkanet root. In the meantime mix the essential oils together shake for 2 minutes. This mixture is lastly added to the coloured bela oil. Keep in bottles well corked for one week shaking occasionally. Then put in suitable phials.

SLATE PENCILS

34 M.B.S.K., Gujranwala—Want to know process of making slate pencil.

Powdered slate	60	parts.
Powdered limestone	30	,,
Sodium silicate	10	,,

Knead together all the ingredients to form a plastic mass and then force it through metallic tubes of suitable diameter fitted with piston Afterwards cut off into usual lengths and bake over a slow fire.

BONE MANURE

58 K.L.M., Delhi—Desires to have a process of making manure from bones.

Bones are but rarely used for manure in their raw condition as they are received from the collectors. As they contain fat their decomposition in the soil takes a long time. So the first treatment of the bones received is to steam them under a pressure of 15 to 20 lbs. i

rder to melt and remove the fat. In some cases he fat is extracted even more thoroughly by ne action of benzene. The boiled or steamed ones thus obtained are sometimes crushed into inch or ½ inch pieces, though there is no nger much demand for material so coarse; ore generally they are ground down into "bone eal." A really fine powder is, however, rarely tained, because the cartilage interferes aterially with the disintegration unless special ethods are employed. It is this crushed material hich is also treated with sulphuric acid for e manufacture of dissolved bones. In glue-aking the cleaner bones are picked out, and, ter the fat extraction, they are broken up and eamed afresh at a much higher pressure and mperature by which process the collogen takes water and becomes converted into gelatine, hich dissolves. The bone residue is ground d sold as "Steamed bone flour." Owing to the moval of the cartilage, this material can be ound finely and forms a dry friable powder ry convenient for use as a manure.

The coarser kinds of bone meal are converted to dissolved bones by being mixed with enough lphuric acid to convert about half the phosates into a soluble condition; steamed bone eal is also often treated with acid, but the oduct is not regarded by the trade as dissolv-l bones, but should be called soluble bone mpound.

LID DISINFECTANT

93 R.C.P.S., Hoshiarpur—Wishes to have formula of solid block disinfectant.

Tallow	15	lbs.
Rosin	3	,,
Light creosote oil	2	gallons.
Naphthalene	2	lbs.
Caustic soda (solid)	2	,,
Water	½	gallon.

Melt the tallow and rosin. Then reduce the e and mix the creosote oil. Now stir in the ustic soda dissolved in the water. Lastly pour to a wooden box. When set take out the ock and cut into small cubes.

TEEL SLATE

99 S.V., Lucknow—Wants to have a process making steel slate.

The artificial slate coating on iron or steel nsists of a mixture of finely ground slate, mpblack, and a water-glass solution of equal rts of carbonate of potash and soda silicate. e process is as follows:—

First prepare the silicate solution by finely ushing equal parts of carbonate of potash and da silicate and pouring over this 6 to 8 times e quantity of soft water, which is kept boiling about 1½ hours whereby the silicate is completely dissolved. Add 7 parts finely crushed slate finely ground with a little water into impalpable dust, 1 part lampblack, which is ground with it, and grind enough of this mass with the previously prepared silicate solution. With this compound the rough form of steel plates are painted as uniformly as possible. Keep aside the painted plates for a week. Then put into a saturated solution of calcium chloride and wash with clear water.

PLASTER OF PARIS

105 M.A.S.F., Adirampatham — Desires to learn a process of manufacturing plaster of paris.

Plaster of Paris is usually manufactured from gypsum. For this purpose first grind the gypsum into powder in a disintegrator; then pass it through 100-120 mesh screen. The fine powder thus obtained is heated to about 120°C in an iron vessel and kept at this temperature for some time. During this period stir the material with a ladle.

INCENSE POWDER

113 H.W.W., Kandy — Wishes to have formulas of incense powder, face powder and tooth powder.

Sandal wood, in powder	300	parts.
Cascarilla, in powder	100	,,
Aguru, in powder	100	,,
Benzoin	150	,,
Saltpetre	30	,,
Patchouli oil	10	,,
Sandal oil	10	,,
Vetivert oil	10	,,
Cassia oil	10	,,

Mix in fine powder and then spray the essential oils over the mixture.

FACE POWDER

Talc	85	lbs.
Magnesium carbonate	7	,,
Zinc stearate	7	,,
Boric acid	1	lb.

Mix and perfume with the following:—

Benzyl acetate	4	oz.
Jarmine oil	2	,,
Musk Ketone	1	,,
Bergamot oil	½	,,
Sandal oil	½	,,
Ionone	40	grs.
Coumarin	60	,,
Alcohol	4	oz.

Mix and keep aside for a fortnight to mature then mix with the powder.

TOOTH POWDER.

Precipitated chalk	35	parts.
Magnesium carbonate	25	"
Borax	14½	"
Sodium bicarbonate	14	"
Soap, powdered	4	"
Sugar, powdered	7½	"
Methyl salicylate	½	part.
Menthol	1/10	"
Cinnamon oil	1/5	"

Dissolve the menthol in the methyl salicylate, add the cinnamon oil and then add to borax and mix with sugar. Add to other ingredients; mix and sift.

FLYPAPER RIBBON.

128 Y.Z., Asansol—Wishes to have formulas of flypaper ribbon and saccharine tablets.

Raw rubber	10	parts.
Rapeseed oil	8	"
Woolfat	2	"
Honey	1	part.
Benzol	79	parts.

Dissolve rubber in benzol. Mix honey with the wool fat and this mixture with the rapeseed oil. Add the honey, wool fat, and oil mixture to the rubber solution. Distill off the benzol and spread the residue on properly sized paper.

SACCHARINE TABLETS.

Saccharine (550)	50	grams.
Sodium bicarbonate	45	"
Theobroma emulsion	a sufficiency.	

Mix into stiff paste and granule with a fine sieve. Dry and make 100 tablets. Each contains saccharine ½ grain.

GRINDING WHEELS.

154 I.D.T.I., Moradabad—Wants to know a method of making grinding wheels.

Grinding wheels and other abrasive articles are made with latex as the binder for the abrasive material.

Carborundum grains	300	parts.
Rubber (from latex)	100	"
Sulphur	20	"
Accelerator	2	"

Cure: 2 hours at 287°F.

To the latex mix made from this formula is added a solution of zinc acetate or other coagulant, the mass being stirred until it has a cheese-like consistency. It is then moulded to shape, dried and vulcanized to the hard rubber stage.

Emery cloth or paper can be made from the formula shown to which glue or casein is added to make the binder more adhesive. It is then spread on fabric or paper, dried and vulcanized in dry heat.

LACQUER FOR IRON TUBES.

Nitrocellulose	18	oz.
Dibutyl phthalate	4	"
Ethyl alcohol	9	"
Methanol	9	"
Acetone	36	"
Butyl acetate	24	"

Mix and keep in a well stoppered bottle.

SHOE POLISH.

229 C.C.W.I., Agra—Wants to have a good formula of shoe polish.

Shellac wax	3	lbs.
Bees wax	1	lb.
Hard paraffin	2	lbs.
Soft soap	1	lb.
Oil soluble dye	1	oz.
Turpentine oil	1½	gallon

Melt the wax over slow fire in capacious iron pan. Next add the soap and heat to dissolve. Then slowly stir in the turpentine oil and lastly dye dissolved in a little turpentine oil; when thoroughly mixed extinguish the fire but go on stirring until the mixture begins to thicken. At this stage pour in tins.

For black use nigrosine oil soluble, for tan use waxoline mahogany and for brown Bismark brown.

HEEL BALL.

Carnauba wax	10	parts.
Hard paraffin	60	"
D. G. Wax	15	"
Beeswax	15	"

Melt over slow fire and then pour into moulds well lubricated with vaseline.

ALOE FIBRE.

Aloe fibre is generally extracted from the leaves of the plant. For this purpose the leaves are selected from the plant, and the thorns by the side of the leaves and their end, are got rid of by shaving and about twenty or thirty prepared leaves are bundled up and thrown into water. The bundles are made up with some stones in the middle to make them heavy so that they can sink down to the bottom. Fermentation will set in and it will take more than a month for its completion. Then it is taken out and beaten on a stone slab with the help of water, so that all the pulp can be washed off; and the fibre then takes the appearance of bleached coarse silk. Tender leaves give a softer and whiter fibre than the matured ones.

By treating this fibre with some chemicals it can be made to attain a lustre, flexibility and shining similar to silk, whereby it can replace silk and textiles can be manufactured out of it. Commercial Hydrochloric acid (weak) mixed with an equal quantity of sweet oil (gingelly oil) will act upon the fibre. The fibre can attain the properties of silk by soaking it in a bath of the

above mixture for fifteen minutes and then removing it into another bath containing only sweet oil and allowing it to remain there for fifteen minutes, and then introducing it into a third bath containing soap solution in which the proportion of soap is one pound to a gallon of water, where it is allowed to remain for half an hour and then rinsing it in clean water. After undergoing these processes clothes can be woven out of it which will have all the requirements of silk. Care should be taken in selecting the tender leaves of aloes for this purpose but to give a fibre tolerably strong they should not be too tender. In selecting the leaves it should be noted that whitish tenderness of leaves is not fitted for the purpose but they should have attained green colour and they should have separated themselves from the conical stem.

Since the fibre is of vegetable origin it can be dyed in the same manner as cotton yarn. Bleaching is not required to be done since the fermentation process makes it thoroughly clean and white.

HAIR REMOVING CREAM.

191 G.B., Achnera—Desires to know the formulas of hair removing cream and rubber solution.

Titanium dioxide	15	grams.
Barium sulphide	37	"
Starch	50	"
Phenol	1	gram.
Lanolin	26	grams.
Stearic acid	5	"
Triethanolamine	1.6	"
Water	137.4	"

Add the triethanolamine and the stearic acid to half the water. Heat the mixture until the stearic acid melts and then stir until a creamy soap forms. Allow the mixture to become lukewarm and then stir in starch and continue to stir until all lumps have disappeared. Dissolve the barium sulphide in the rest of the water and bring to a boil. Then stir in the soap-starch solution and continue stirring until the mixture thickens. Add the melted lanolin and stir. The slowly sift in the titanium dioxide and mix until smooth. Finally add the phenol and perfume with lavender oil or any other strong essential oil.

RUBBER CEMENTS.

Rubber cement is ordinarily understood to be a solution of rubber, in gasoline, benzene, carbon tetrachloride or other organic solvent with or without accessory ingredients. Within recent years, however, rubber latex and preparations made from it have come to be used for many of the same purposes as the abovementioned cement and are sometimes called cements. These products will be treated briefly, but to avoid confusion they will be designated as latex cements, and the term rubber cement will be used to mean solutions of rubber in gasoline or other non-aqueous solvents. A detail process of making this rubber cement is as follows:—

In order to prepare this article fresh raw rubber cut in small pieces is placed in a bottle of naphtha or benzine in the proportion of 1 part of the former to 5 of the latter. The rubber gradually swells absorbing the solvent and eventually loses its tenacity. Now the mass on vigorously stirring or the bottle on shaking at a certain stage and this treatment repeated from time to time, an apparently homogeneous solution is finally obtained. This rubber solution is very sticky and tenacious. But if the raw rubber is not fresh it is better to masticate it in a kneading machine whereby it is reduced to impalpable paste. Now take one part of this paste and put it into 5 parts of naphtha or benzine contained in a suitable bottle. Shake for a while. The rubber readily goes into solution into a less viscous mass than untreated rubber.

PEPSIN.

193 S.V.L., Barnala—Desires to know the process of preparing pepsin.

Pepsin is a substance containing a proteolytic enzyme present in the gastric juices of animals. It is obtained from the mucous membrame of the stomach of certain animals commonly used for food, particularly the pig, sheep, or calf. It may be prepared by mincing the mucous membrane of the stomach and macerating it in slightly acidified water, or in a mixture of glycerine and water. The pepsin is precipitated from the filtered liquid by the addition of a neutral salt such as ammonium sulphate; the precipitate is suspended in water and freed from the salt by dialysis, and the aqueous solution is evaporated in vacuo or scaled.

BENZYL ACETATE OR ARTIFICIAL JASMINE.

197 H.S.M., Gulbarga—Wants to know the process of preparing benzyl acetate.

Benzyl acetate is a colourless, sweet smelling, fruity liquid. 5 parts of benzyl chloride, 4 parts of glacial acetic acid and 4 parts of fused sodium acetate are boiled for about 24 hours when the reaction is complete. The acetic acid merely acts as a solvent. The esterification is followed by taking, from time to time, samples and estimatng the unchanged benzyl chloride; when it is complete the excess of acetic acid is distilled off, the residue is washed with water and distilled at 21°C.

—BRIEF QUERIES AND REPL

Questions of any kind within the scope of Industry are invited. Enquiries or replies fro experts will be published free of charge in serial order. Questions are replied by post on r of As. 8 stamps for each question. Subscribers outside India are requested to send International Reply coupons for each question. In order to facilitate the work of Editor's D ment and to help prompt action the readers are requested to send enquiries in separate l

2496 R.D.G., Lashkar—Following is a list of gramophone record manufacturers:—Gramophone Co., Ltd., 33, Jessore Road, Dum Dum; Megaphone Co., 77-1, Harrison Road, Calcutta; Twin Record Co. Ltd., 33, Jessore Road, Dum Dum and Viel-o-Phone Co., Mahim, Bombay. You may write to the firms mentioning your experience in the line.

2500 B.R., Bombay—It is not possible to manufacture 1 lb. butter from 1 pint milk.

2501 C.B.S., Jharia—For learning motor driving you may negotiate with French Motor Car Co. Ltd.,243-3, Lower Circular Road, Calcutta.

2502 S.S.R., Khargpur—Review of curry powder appeared in October 1949 issue of Industry.

2503 A.S.T., Melapalayam—You may consult Technology and Manufacture of Printing Ink by G. N. Sarma published from this office, price Rs. 3/7/- including postage. You may also consult Manufacture of Ink and Cotton Dyeing and Printing published from this office, price Rs. 3/7/- each.

2504 E.I.L., Trichur—You may enquire of Signograph Co., Barnagore, Calcutta for transfer picture.

2505 M.R.B., Amritsar—Process of manufacturing tennis gut will appear in Formula Section in usual course.

2507 A. C., Kapurthala—Confectionery machine may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta. We have no such pamphlets.

2511 N.I., Jullundur City—For asphalt enquire of Bitumen Emulsions (India) Ltd., Hide Road, Kidderpur, Calcutta and H. Mumtaz & Co., 1, Colootola Street, Calcutta. If you go through October 1949 issue of Industry you will get all information regarding porcelain manufacture. For moulds for graphite crucible enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

2512 H.B.M., Purnea—For dairy machine enquire of Edward Keventers Ltd., 11/3, Lindsay Street, Calcutta.

2515 S.C.M., Rewa—We are not aw any such institute.

2519 R.N.P., Sambalpur—For glass to H. J. Foster & Co. Ltd., P.O. Box No Bombay. For gripe water write to B. K. & Co. Ltd., 1 & 3, Bonfield Lane, Calcutta

2520 S.F., Nasik—You may consult facture of Soap published from this office, Rs. 4/7/- including postage. Soap ma may be had of Small Machineries Mfg. C R. G. Kar Road, Calcutta. For securing you may advertise in newspapers.

2522 J.K., Bombay—Answer is give post on receipt of 8 annas stamps for eac mula.

2523 S.K.S., Kathiawar—Process manufacturing boot polish will be fou Prospective Industries. Following is a mula of Kum Kum:—Wax 1¼ dr; almo 3 dr; carmine 6 gr.; otto of rose 6 drops. oil. Now dissolve the carmine in just e solution of ammonia, put in a warm n the wax over water bath. Next remove fro water bath and incorporate the otto. almost cool the mass is cast into moulds sired length.

2524 M.S.R., Jammu—A good reci gripe water appeared in December 1948 of Industry. A good recipe of toothache appeared in February 1949 issue of Indus

2529 K.N.M., Tenali—Following is of tile dealers:—Art Floors Ltd., 1 & 3, Row; Cloci Floors Ltd., 61, Palm Avenue lygunj; Crown Italian Marble Works, 9 sion Row and Winter Bros. Ltd., Merc Bldg., Lall Bazar, all of Calcutta.

2530 B.N.S., Berhampore—For ghan quire of Marshall Sons & Co., Ltd., 99, Subhas Road, Calcutta.

2535 A.D., Amritsar—For steam la machine enquire of Jessop & Co., 93, Subhas Road, Calcutta. Particulars rega machines and their working will also be plied by the above firms.

2536 J.V., Tanuku—For selling butter you should advertise in newspapers and periodical.

2539 R.M.D., Raipur—Your letter has already been replied by post.

2541 R.L.W., Sivakasi—Process of manufacturing litho varnish will appear in Formula section in due course.

2546 H.L.B., Delhi—Process of printing on glass will appear in Formula section in due course.

2547 M.A., Lahore—Tape and newar knitting machines may be had of W. H. Brady & Co. Ltd., Mercantile Bldg., Lall Bazar, Calcutta.

2548 M.S., Meerut Cantt.—Formulas of sealing wax, powder, chapra etc. will appear in Formula section in due course.

2550 K.H.R., Rajahmundry—For fancy goods enquire of A. K. Roy, 119E, Bowbazar Street, Calcutta; Fancy Stores, 209, Bowbazar Street, Royal Store, A-24, 25, 26, Municipal Market and S. C. Saha & Co., A34, Municipal Market; all of Calcutta.

2551 M.C., Neemuch Cantt.—Formulas of tartaric acid will appear in Formula section in due course.

2552 T.A., Delhi—Process of manufacturing rubber soles and heels will be found in Manufacture of Rubber Goods published from this office, price Rs. 3-7, including postage.

2553 AV.A.C., Coimbatore—Your query is not in our line.

2554 P.P.S.C., Delhi—We are not aware of any such institution. Process of manufacturing snuff will be found in Indian Tobacco and its Preparations published from this office, price Rs. 3-7, including postage.

2555 S.E.M.H.S., Colombo—For button making machine enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta. For leather grinding machine enquire of Marshall Sons & Co. Ltd., 99, Netaji Subhas Road, Calcutta. Wants to be put in touch with the importers of Chank and coconut shell charcoal. Wants to be put in touch with the suppliers of bone grist and mohua oil seeds from India. We have no book on forage manufacture.

2559 K.H., Bombay—Incubators may be had of T.E. Thompson & Co. Ltd., 9, Esplanade East Calcutta.

2563 K.B., Shivpuri—For rubber stamp making appliances enquire of B. Goray & Co., 156, Cornwallis Street, Calcutta.

2564 D.S.R., Berinag—It is not possible to artificially colour tea.

2565 B.I.M.P., Ludhiana—Rubber baloon making machines may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

2566 B.R.M., Shikohabad—We have no book on enamelling. You may enquire of Standard Literature Co. Ltd., 13-1, Old Court House Street, Calcutta for the book on enamelling.

2567 R.N.L.S., Kanpur—You may use ink eradicator for removing ink stains from paper. Following is a formula of ink eradicator:—Alum 2 lbs.; citric acid 2 lbs. Mix thoroughly and dissolve in 3 lbs. water.

2568 S.C.B., Cachar—Process of manufacturing bread, biscuit and cake will be found in Home Industries published from this office, price Rs. 3-7, including postage.

2569 D.M.D.D., Delhi—Printing materials may be had of John Dickinson & Co., 6, Clive Row, Calcutta and Printing and Industrial Machinery Ltd., Windsor House, P-14, Bentinck Street, Calcutta. Process engraving materials may be had of Photographic Stores & Agency Co. Ltd., 154, Dharamtala Street, Calcutta.

2572 A.T.C., Ferozabad—It is not possible to preserve khoa for long time. If you add some sugar to this in course of preparation Khoa will keep good for some time.

2573 H.S.M., Agra Cantt.—Process of manufacturing gripe water, candle, face cream, etc. will appear in Formula section in due course. You may enquire of Calcutta Chemical Co. Ld., 10, Bonfield Lane, Calcutta for industrial chemicals.

2574 A.A.G., Dhrapha—For knitting machine enquire of Paul's Engineering Co., 207, Belilios Road, Howrah. A good formula of snow appeared in October, 1948 issue of Industry., Process of silvering glass will be found in May 1947 issue of Industry.

2575 K.A.G., Sowrastra—For talc and manganese carb enquire of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta. Formulas of all sorts of ink will be found in Manufacture of Ink published from this office, price Rs. 3-7, including postage.

2576 V.S., Jodhpur—Special signs signifies the brand of the ingredients used.

2577 A.H.P., Dhrol—An article on plastic manufacture appeared in December 1948 issue of Industry.

2579 R.M.D., Raipur — After removing the outer shell of the tamarind seeds boil them in water when you will get a pasty substance which may be used as adhesive gum.

2581 M.T.A., Rangoon—For generator enquire of General Electric Co. (India) Ltd., Magnet House, Chittaranjan Avenue, Calcutta.

2582 M.M.S.R., Jammu—For learning conjuring art you may negotiate with Prof.

Kapoor, Bengali Magic School, Nana Peth, Near Ghode Pir, Poona 2.

2583 D.K.S., Lucknow—You may consult Indian Perfumes Essences and Hair Oils; Dental Preparations; Pickles, Chutneys and Morabbas; and Manufacture of Soap; all the books are published from this office.

2584 P.S.I., Talod—You may consult Manufacture of Disinfectants and Antiseptic, published from this office, price Rs. 3-7, including postage.

2588 C.R.H., Nagpur—You may refer your query to Signograph Co., Barnagore, Calcutta 36.

2589 K.P.L., Raniganj—For cinema accessories you may enquire of Evergreen Picture Corpn., 11, Esplanade East and Greentose Corporation (India), 81, Netaji Subhas Road, Calcutta.

2591 L.J., Chingleput—To preapre table salt dissolve lump rock salt in four times its weight of distilled water filter and then drop into the filtered solution first a chloride of barium and afterwards carbonate of soda as long as any precipitate falls. Then filter and evaporate the clear fluid very slowly until crystals begin to appear. When this condition has been reached set aside the solution for a day. The crystals are taken out, dried and kept in bottles.

2592 Y.C.K., Bellary—Process of manufacturing brass seal will appear in Formula section in due course.

2596 R.M.W., Sivakasi—Wants to be put in touch with the dealers in safety matches.

2597 M.V.S.R., Kondapalli—Process of silvering mirror will be found in Independent Careers for the Young published from this office, price Rs. 3/7/- including postage.

2599 S.O.S.C.W., Jubbulpore—In order to remove the defect of the soap manufactured by you add a little metanil yellow to the soap.

2600 S.G.S.F., Salem—Collapsible tubes may be had of Metal Box Co. of India Ltd., B2, Hide Road, Kidderpur, Calcutta. Cardboard boxes may be had of Bengal Cardboard Industries, & Printers Ltd., 165, Cornwallis Street, Calcutta.

2605 M.B., Palai—Wants to be put in touch with the suppliers of hemp, manila, sisal and luffar.

2606 A.P.T.C., Tinsukia—An exhaustive article on glass industry appeared in April 1948 issue of Industry. If you go through the article you will get all information required.

2610 A.C.A., Bombay—Chemicals may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta. Shellac may be had of Indian Herb Store, 31, Mullick Street, Calcutta.

2611 V.N.B., Udipi—Dry cell making materials may be had of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta. You may go through Independent Careers for the Young published from this office, price Rs. 3/7/- including postage. Sawdust 10 parts; powdered charcoal 6 parts; nitre 2 parts; gum benzoin 4 parts; hard tolu balsam 2 parts; insect powder 4 parts; water q.s.; green colour 2 parts. Reduce all the ingredients separately to fine powder and pass through sieve. Next dissolve the nitre in a small amount of water. Make a stiff mass of wheat flour with this nitre solution using more water if required. Incorporate into mass the mixture of saw dust and charcoal powder. Add a little more water if required. Lastly mix the remaining ingredients. The mass thus produced is put into a plodding machine where by means of a spiral screw the mass is forced under great pressure through a number of holes of required diameter, so that the mass passes out of the machine in the form of a number of continuous rods or pencils. These rods are collected on a horizontal table and cut off in equal lengths. Then convert into coils by turning them with wooden rod and expose to dry. Pack.

2615 H.O., Aira—For tin printing negotiate with Bengal Tin Box Mfg. Co. Ltd., 1, Ja[illegible] Nath Mitter Lane and National Sheet & Metal Works Ltd., 36A, Sahitya Parishad Street; both of Calcutta.

2620 T.D., Kanpur—Collapsible tubes may be had of Metal Box Co. of India Ltd., B2, Hide Road, Kidderpur, Calcutta.

2626 B.D.T., Bombay—You may use molasses as binding agent. You may use any kind of stamping machine.

2627 H.L.K., Delhi—Carbon rod may be had of Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road and General Electric Co. (India) Ltd., Magnet House, Central Avenue South both of Calcutta. Zinc sheets may be had of Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road, Calcutta. Process of manufacturing boot polish will be found in Prospective Industries published from this office, price Rs. 3/7/- including postage.

2628 D.C.T.C., Nadiad—Can supply babul bark powder.

2629 K. L. D., Manendragarh—Chemicals may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane and Allied Agency, 16, Bonfield Lane; both of Calcutta.

2631 R.G.G., Agra—All the raw materials required for toilet goods preparation may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta; Ghose Bros., 50, Ezra Street, and [illegible] N. Sarkar, 37, Canning Street; all of Calcutta.

2632 J.S.F., Sholapur—It is not possible , detect impurities in oil without hemical analysis. You may use coconut oil , the stamping dies. Use of soap colour has en detailed in Manufacture of Soap.

2633 K.C., Shivpuri—For selling forest oducts you may negotiate with the following rms:—Indian Herb Store, 31, Mullick Street anshidhar Dutt, 126, Khengrapatty Street, arrabazar; both of Calcutta. You may burn mestone with coke. You may negotiate with lcutta Mineral Supply Co. Ltd., 31, Jackson ine, Calcutta for supplyng marble.

2634 L.C., Calcutta—Shellac is manufacred by A. M. Arathoon Ltd., 11, Stephen ouse, Dalhousie Square, Calcutta; Tollygunge ellac Factory, Hathibari, Tollygunge, Calcutta. u may consult Indian Perfumes, Essences and ir Oils published from this office, price Rs. 7/- including postage.

2635 P.S.C., Dacca—For the book required u may enquire of Standard Literature Co. 1., 13/1, Old Court House Street and Thacker ink & Co. (1933) Ltd., 3, Esplanade East, h of Calcutta.

2636 M.C., Neemuch Cantt.—Process of nufacturing menthol and tartaric acid will pear in Formula section in due course.

2637 S.M., Calcutta—Wire nail making chines may be had of Oriental Machinery pplying Agency Ltd., P12, Mission Row Exsion, Calcutta. The firm will supply you with estimate for starting a factory with their chine.

2638 S.N.A., Etawah—For starting a cinema se you should invest at least Rs. 2 lakhs. have to build a house suitable for exhibi of cinema films according to local requiret. As regards machines and accessories may enquire of Evergreen Pictures Corration, 11, Esplanade East and Friends Unisal Talkie Equipment, 36, Dharamtala Street; of Calcutta.

2639 D.P.M., Dehra Dun—Try to be a paid rentice in a factory.

2640 B.K.S., Amritsar—The following is composition of a lithographic ink:—Bleach eeswax 80 parts; tallow soap 20 parts; shel 20 parts; American gas black 25 parts. This ld be thinned by adding linseed oil.

2641 F.C., Kanpur—For sulphur and arseyou may enquire of Indian Herb Stores, 21, lick Street, Calcutta.

2642 G.C.M.C., Abohar—For galvanised s enquire of Kumar Bros. & Co. Ltd., 14 & Raja Woodmunt Street, Calcutta; Jogendra Chatterjee & Sons, 21, Maharshi Debendra d and Greentose Corpn. (India) Ltd., 81, ji Subhas Road, Calcutta.

2643 M.M.R., Trichur—Chemicals may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, and Ghose Bros., 50, Ezra Street; both of Calcutta. Indigenous products may be had of Indian Herbs Store, 31, Mullick Street and Banshidhar Dutt, 126, Khengrapatty Street; both of Calcutta.

2644 A.A.S., Bangalore—For books on homeopathy in Hindi and Urdu enquire of M. Bhattacharyya & Co., 84, Netaji Subhas Road, Calcutta; Bharat Homeo Pharmacy, Post Box 88, Nazarbagh, Lucknow and Hahnemann Publishing Co., 165, Bowbazar St., Calcutta.

2645 N.C.I., Tuni—Tin cans may be had of Bengal Tin Box Mfg. Co. Ltd., 1, Jadu Nath Mitter Lane, Shambazar, Calcutta and National Sheet & Metal Works Ltd., 36A, Sahitya Porishad Street, Calcutta.

2646 J.M.C., Faridpur—After boiling for several times you will be able to standardise the density of ink. You may add gum arabic and sulphuric acid not more than 5 per cent. You should use indigo carmine in ink. You may use industrial thermometer for ascertaining temperature of boiling water. You may also use ink blue which may be had of Champalal Agarwala, 45, Armenian Street, Calcutta.

2647 B.R.R., Bangalore—Candle making machines may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta.

2648 C.P., Nagercoil—Process of manufacturing book binding cloth and crown corks will appear in Formula Section in due course.

2649 B.L.C., New Delhi—For starting money making scheme selling business you should advertise in Industry. Your enquiry is in the nature of an advertisement so this cannot be published in these columns.

2650 S.I.M.W., Indore City—For hosiery machines enquire of A. N. Sayal & Sons, 76, Ramnagar, New Delhi. You may also start lozenge making. Lozenge machine may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta.

2651 A.A., Lucknow —For weighing machine enquire of W. & T. Avery Ltd., Avery House, 28, Waterloo Street and India Machinery Co. Ltd., 29, Strand Road; both of Calcutta.

2652 H.B., Amritsar—We have no book dealing with vernacular names of chemicals.

2653 M.R.K., Amritsar—We have no book on dye manufacture. You may try W. Newman & Co. Ltd., 3 & 4, Old Court House Street and Standard Literature Co. Ltd., 13-1, Old Court House Street, both of Calcutta. There is no such institution where dye manufacture is taught.

2654 R.R., Patna—Following is a formula of white ant killer: Orthodichlor benzol 24 parts; solvent naphtha 45 parts; betanaphthol 4 parts; rosin 4 parts; rect. spirit 7 parts. Mix all together and keep in airtight bottles.

2655 B.V.P., Amraoti—For incubator enquire of T.E. Thomson & Co. Ltd., 9, Esplanade East, Calcutta.

2656 S.R., Coimbatore—Following is a list of cloth merchants: East Bengal Society, Ashutosh Building, 87-2, College Street; Haralalka & Co., 52-1-1, College Street; Haripada Paul, 101, Harrison Road; Jaminiranjan Paul, 203-1, Harrison Road and Laxmi Stores, 90-9A, Harrison Road; all of Calcutta.

2657 F.S.B., Ludhiana—Collapsible tubes may be had of Metal Box Co. of India Ltd., B2, Hide Road, Kidderpore, Calcutta. Tin can may be had of Bengal Tin Box Mfg. Co. Ltd., 1, Jadu Nath Mitter Lane, Shambazar, Calcutta. Bottles may be had of Ananta Kumar Ghose & Co., 9, Ezra Street and Bimal Bottle Stores, 130, Radha Bazar Street; both of Calcutta.

2658 V.C.T., Wattala—Slate powder may be had of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta. For transfer labels enquire of Signograph Co., Baranagore, Calcutta 36.

2659 V.G., Bombay—For lathes and other machines enquire of T.E. Thomson & Co. Ltd., 9, Esplanade East, Calcutta; Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta and Machine Tools (India) Ltd., Stephen House, 4, Dalhousie Square, Calcutta.

2660 R.K.P., Gondia—You better seek legal advice.

2661 D.H.E.M., Mangalore—You may consult Vegetable Oil Industry published from this office, price Rs. 3-7, including postage. As regards refining tallow you may treat it with washing soda solution, i.e., boil with a weak solution of washing soda when impurities will separate and settle at the bottom.

2662 S.K.M., Bombay—For duplicating machine you may enquire of Gestetner (India) Ltd., 32, Grosvenor House, Old Court House Street, Calcutta.

2663 R.M.D., Raipur—Reply to your letter has already been sent by post.

2675 K.S.L., Nairobi—The first operation in sunth making is to soak the rhizomes in water. This with rubbing cleans the rhizomes and also softens them. The soaking facilitates the removal of the outer skin. It is scraped off with a shell or broken piece of earthenware. The scraped ginger is now washed and exposed for three or four days to the sun on an ordinary threshing floor. The ginger is thus bleached and dried. It is now rubbed by hand. 1 object is not clear. The operation is done ca fully, so that the shoots are not broken. 1 ginger is then bleached in the sun for three four days and again hand rubbed. It is n steeped in water for two hours and exposed a clean floor to the sun until it gets dry. W dry it is rubbed on a coarse cloth or coarse sa ing. The sunth is now ready for market. preparing turmeric tubers are cleaned, strip of the fibrous roots and heated gradually earthen pots, the mouths of which are caref closed by lids fastened with cowdung. rhizomes are thus stewed in their own ju and freed thereby of the raw smell. Afterwa they are dried in the sun for nearly a w being protected at night from dew.

2676 M.J.P., Meerut City—Process manufacturing jintan, kimam and hair curl lotion wll appear in Formula Section in course.

2677 R.S.G., Agra—You may start che cal analysis as your off time occupation; thi a profitable business and has future prospec

2678 K.K.M., Jodhpur—Following is formula of ultramarine blue: China clay parts by weight; sulphate of soda 41 par carbonate of soda 41 parts; carbon 17 pa sulphur 13 parts; sulphite of soda 26 pa Take the ingredients free from iron and gr fine. Next heat in a muffle furnace in clo pots. This produces white ultramarine turns blue on exposure to air for some ti The latter is mixed with 4 per cent. sulp and roasted in shallow pans, must be stirred.

2679 A.P.D., Dehra Dun—There is solvent for plastic. For chemical testing may write to the Chemical Director, Indust Research Laboratory, 22, R. G. Kar Road, cutta.

2680 K.P.S., Sodepur—Benzoated oil pared by you should be diluted with veget oils for making hair oil.

2681 A.A.K., Khurja—For selling machines and other equipment you may ad tise in the pages of Industry. It is very diffi on our part to suggest names of probable bu

2682 M.M.M., Calcutta—For barbed making machines you may enquire of Fra Klein & Co. Ltd., 1, Royal Exchange Pl Balmer Lawrie & Co. Ltd., 103, Netaji Sub Road and Alfred Herbert (India) Ltd., 1 Strand Road, all of Calcutta.

2683 N.S.W.W., Nagpur—Sodium sili may be had of Calcutta Mineral Supply Ltd., 31, Jackson Lane; Gujarat Silicate Wo 241, Manicktala Main Road and Punjab Sili

Works, 28, Bagmari Road; all of Calcutta. Lampblack may be had of Abinash Chandra Dutta, 81, Shambazar Street; Haranath Paint Works, 71-A, Netaji Subhas Road and Koylash Chandra Dutt & Sons, 20, Bonfield Lane; all of Calcutta.

2684 R.M.B.C., Ahmedabad—For rubber stamp making rubber write to B. Goray & Co., 156, Cornwallis Street, Calcutta.

2685 S.M.Y., Kandy—For coffee grinding machines enquire of Batliboi & Co., Forbes Street, Fort, Bombay.

2686 C.A., Bodinayakanur—Following is a formula of bed bug killing powder: Alum powdered 80 parts; boric acid, powdered 10 parts; salicylic acid 10 parts. Powder very finely. You may read Bombay Chronicle, Parsi Bazar Street, Fort, Bombay and Bombay Daily News, 36, Islampura, Bombay 4.

2687 C.T.W., Calicut—For sheet metal working machines enquire of Alfred Herbert (India) Ltd., 13-3, Strand Road, Calcutta.

2689 S.S.C., Delhi—For polishing slate first apply a coating of Japan black and when completely dry rub with pumice stone.

2690 R. P. V. C., Ludhiana — You may use ordinary paste prepared with ordinary flour. Following is a recipe of rubber stamp ink: Aniline black 1 part; alcohol 30 parts; glycerine 30 parts. Mix and pour upon the cushion of the stamp and rub with a brush. For writing on wall and on wooden door you have to use paint.

2691 B.P., Monghyr—For thread spinning machine you may enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta. The firm will supply you with an estimate for starting business with their machine.

2692 R.M.D., Raipur—Reply to your letter has been sent by post.

2693 M.M.S., Delhi—Following is a recipe of motor brake fluid: Ethyl acetate 3 oz.; castor oil 2 oz. Following is a formula of hair fixative: Tincture of benzoin, 970 parts; perfume 10 parts; venetian turpentine 2 parts.

2694 S.K.V., Lucknow—For radio sets and amplifiers enquire of Bengal Trading Co., P33, Ganesh Chandra Avenue, Calcutta 12; Devans Radio Corporation, 79, Harrison Road, Calcutta and National Radio Co., 219, Chittaranjan Avenue, Calcutta.

2695 N.C.I., Tuni—For exporting toys to foreign countries you have to secure Export License. For securing Export License you may write to Controller of Exports, New Delhi.

2696 A.K.D., Barajaguli—You may start a poultry farm with Rs. 5000/- on a small scale. For incubator machine you may enquire of T.E. Thomson & Co Ltd., 9, Esplanade East, Calcutta. It is better if you can arrange with an expert who can advise you on starting the poultry farm.

2697 K.B.L., Ludhiana—Following is a formula of castor oil chocolate:—Castor oil 1 part; refined sugar 2 parts; chocolate powder 1 part; tincture of vanilla q.s. Incorporate the castor oil with the chocolate powder; add the sugar with which the vanilla tincture has been thoroughly mixed. Work the ingredients well together in a fairly warm mortar and while soft place it in moulds or cut to desired size in a cold marble slab. Allow to cool and pack.

2698 G.M.A., Darjeeling—For plaster of paris enquire of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta.

2699 B.P.C.I., Dacca—Japanese addresses are not available at present.

2700 K.K.S., Kanpur—Following is a formula of starch solution to be used for imparting gloss to textiles: Sodium hexametaphosphate (25 p.c. solution) 1 qt.; prepared starch solution 25 gal.

2701 D.R.B., Chaibasa—You have to use emery grinding wheel for sharpening knives, razors, scissors, etc. Emery wheels are prepared with emery powder using magnesite as binding agent. The feature of this process is that the pulpy mixture of magnesium chloride solution, magnesite and emery powder is placed in metal moulds, which are mounted on a jig-table, the vibraton of which causes the specifically heaviest portions of the mixture, viz. the grains of emery to settle down gradually to the bottom of the mould as compactly as possible, each grain having time to assume the most suitable position with regard to its neighbours. This process gives an emery wheel consisting of 90 per cent emery and only 10 per cent magnesite binding medium, the superfluous portion of the latter, being forced upward by the five pin movement of the table and then easily removed.

2702 K.R.S., Simla—For registration of medicine you may enquire of Dutt & Co., 82, Harrison Road, Calcutta and Law Morris & Co., 19, Strand Road, Calcutta. For glass phials enquire of Naini Glass Works, 187, Bahadurganj, Allahabad and Pioneer Glass Works, Nagina.

2703 V.D.B., Rohtak—Process of manufacturing carbon rod appeared in September 1949 issue of Industry.

2704 M.C.L., Nagpur—For transfer enquire of Signogroph Co., Baranagore, Calcutt 36.

2705 G.D., Karachi—Process of manufacturing automobile polish will appear in Formula Section in due course.

2706 S.C.G., Cawnpore—An article on pottery industry appeared in October 1949 issue of Industry. If you go through that article you will get all information required.

2707 S.R.M., Kumbakonam—A good formula of sparkler appeared in September 1949 issue of Industry. You may use gum solution as binding agent.

2708 P.S.D.B., Calcutta—Addresses of newspapers of small villages are not known.

2709 N.S., New Delhi—Following is a formula of thinner: Petrol or solvent naphtha 50 p.c.; alcohol 15 p.c.; ethyl acetate 15 p.c.; buthyl acetate 20 p.c. Mix and pack air-tight.

2719 R.S.S., Yeotmal—Address of Forest Research Institute is Dehra Dun. Citric acid is manufactured from lime and not from tama-

rind. Tartaric acid is manufactured from tamarind. But this is still in experimental stage. Process of manufacturing tincture will be found in Pharmaceutical Preparations published from this office, price Rs. 3/7/- including postage. It is not possible to preserve milk for 72 hours. Jute thread is made from jute with the help of a spinning machine. Milk powder should be packed in air-tight tins.

2743 L.P., Monghyr—We have no book on candle manufacture. An article on candle manufacture appeared in May 1949 issue of Industry. Candle making machine may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta.

2744 S.N.C., Allahabad—A good formula of washing soap will be found in February 1949 issue of Industry. Process of manufacturing all kinds of ink will be found in Manufacture of Ink published from this office, price Rs. 3/7/- including postage.

2745 K.S.V., Davangere—For bone mill machines enquire of Marshall Sons & Co. Ltd., 99, Netaji Subhas Road, Calcutta. The above firm will supply you with a list of machines required and an estimate for starting the factory.

2746 M.M.R., Gudivada—To clarify castor oil mix 100 parts of the oil at 95°F with a mixture of 1 part of alcohol (96 per cent) and 1 part of sulphuric acid. Allow to settle for 24 hours and then carefully decant from the precipitate. Now wash with warm water boiling for ½ hour allow to settle for 24 hours in well closed vessels after which time the purified oil may be taken off.

2747 R.L.S., Kakinada—We have no book on capsule manufacture.

2748 K.C., Hoshiarpur—For plastic sheets enquire of Plastic Fashions Ltd., 74A, Regent Street, London; Portland Plastic Ltd., 214, Gt. Portland Street, London W1 and Spauldings Ltd., Gloucester Way, London E.C.1. Plastic powder may be had of Imperial Chemical Industries (India) Ltd., 16, Strand Road, Calcutta.

2749 M.A.S.S., Calicut—Vide No. 2746 above.

2750 H.I., Ludhiana—For power looms enquire of W. H. Brady & Co. Ltd., Mercantile Bldg.,Lall Bazar, Calcutta. The above firm will supply you with an estimate for starting a factory with their looms.

2751 D.I., Kalimpong—Following is a formula of dry cleaning fluid: Glycerol oleate 2 fl.oz.; carbon tetrachloride 60 fl.oz.; solvent naphtha 20 fl.oz; benzine 18 fl.oz. Mix. This is an excellent cleaner that will not injure the finest fabric.

2952 G.C.J., Kotah — Electroplating equipments may be had of Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta.

2753 S.C.G., Kanpur—Process of manufacturing boot polish of all kinds will be found in Prospective Industries published from this office, price Rs. 3/7/- including postage. Tin cans may be had of Bengal Tin Box Mfg. Co., Ltd., 1, Jadu Nath Mitter Lane, Calcutta 4.

2754 D.N.P., Gwalior—For envelope making you have to use envelope making machine which may be had of Oriental Machinery Su[illegible] plying Agency Ltd., P12, Mission Row Ext[illegible] sion, Calcutta. The above firm will supply y[illegible] with estimate and other information.

2755 G.S.A., Thana—Following is a f[illegible] mula of ink eradicator: Alum 2 lbs.; citric a[illegible] 2 lbs. Mix thoroughly and dissolve in 5 [illegible] water.

2756 A.K.N., Dhing—Process of silver[illegible] glass will be found in Independent Careers [illegible] the Young published from this office, price [illegible] 3/7/- including postage.

2757 S.D.R., Nasik—Following is a form[illegible] of chalk crayon: Precipitated chalk 40 par[illegible] plaster of paris 40 parts; lithopone 10 par[illegible] glue solution 5.10 parts. Knead all together [illegible] make a soft dough and pour into gun me[illegible] moulds. When set take out and allow to [illegible] in air. Then put all together in a tray [illegible] moderately bake over mild fire.

2758 G.P., Chandausi—For the camera [illegible] quired enquire of Photographic Stores & Agen[illegible] Co. Ltd., 154, Dharamtala Street, Calcutta.

2759 T.P.U., Mathurai—Rubber goods m[illegible] be had of Bengal Waterproof Works Ltd., [illegible] Theatre Road, Calcutta and Bhattacharjee R[illegible] ber Works, 174, Jessore Road., Dum Dum, [illegible] Parganas.

2760 P.M., Bankura—For wire nail maki[illegible] machine enquire of Oriental Machinery Supp[illegible] ng Agency Ltd., P12, Mission Row Extensi[illegible] Calcutta.

2778 J.A.S., Ranchi—For colours enqu[illegible] of Champalal Agarwala, 45, Armenian Stre[illegible] Calcutta.

2779 A.R.L., Madura—For the book [illegible] plastic industry enquire of Standard Literatu[illegible] Co. Ltd., 13/1, Old Court House Street, Calcu[illegible] and W. Newman & Co. Ltd., 3 & 4, Old Co[illegible] House Street, Calcutta.

2780 G.P., Agra—Following is a form[illegible] of porcelain and glass cement: Isinglass 1 o[illegible] powdered glue 1 dr.; distilled water 2 oz., sa[illegible] cylic acid 10 gr. Put the isinglass and glue [illegible] a gallipot add the salicylic acid and the wat[illegible] pressing down the isinglass with a pestle u[illegible] it is all soaked. Place the gallipot in a sau[illegible] pan of water, bring to the boil, stirring u[illegible] dissolved, then add acetic acid (33 p.c.) 1 [illegible] Mix well, and pour into bottles.

2781 S.C.S., Dum Dum—For starting a s[illegible] factory you require a sewing machine. Ot[illegible] operations may be done by hand by expert [illegible] tries.

2782 A.L.S., Delhi—Process of manuf[illegible] turing photo engraving glue will appear in F[illegible] mula Section in due course.

2783 A.M.S.M., Madras—A good formula [illegible] grinding paste will appear in Formula Sect[illegible] in due course.

2784 M.K.N., Ajmeir—For starting a che[illegible] cal factory for manufacturing proprietory me[illegible] cines you have to secure Drug License. [illegible] securing Drug License you may write to Prov[illegible] cial Drug Committee.

2794 M.S., Lahore—We have no book [illegible] glass industry. You may however write

Standard Literature Co. Ltd., 13/1, Old Court House Street, Calcutta and Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta for books on glass manufacture.

2795 G.R.D., Tinnevelly—Following is a list of Chinaclay merchants of South India; East India China Clay Co., 6, Mollikuppana, Madras and Travancore Government Clay Refining & Porcelain Concern, Kundara, S. I. Ry.

2796 E.A.M., Bombay—An article on colouring aluminium appeared in January 1949 issue of Industry. If you go through the article you will get all the information required.

2797 M.S., Thana—Following is the process of making alum blocks: Dissolve 100 oz. of alum in small quantity of water. Add to it 1 oz. of menthol dissolved in a little spirit and mix with 1 oz. of glycerin. Then heat the mixture on a water bath to evaporate the water. As soon as almost the whole of water has been evaporated, pour the hot mass into rectangular moulds and set aside to crystallise. After a day or two take out the blocks and rub their surface with hot water to make them smooth. Following is a formula of sealing wax: Shellac 14 parts; rosin 24 parts; vermilion 1½ parts; barytes 14 parts; whiting 4 parts; turpentine 4 parts. Melt the shellac and rosin over a slow fire. Keep hot and work in the pigments. Lastly add the turpentine oil. Cast into sticks.

2798 S.S.S.C., Monghyr—You better consult a lawyer.

2799 M.J., Vijayavada—For emboss printing enquire of Loyal Art Press, 20, Strand Road; Prima Printers & Stationeries, 9, Pollock Street and Ruby Press, 35-A, Swallow Lane; all of Calcutta.

2800 B.C.S., Raghunathpur—Refer your query to Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road, Calcutta.

2801 S.N.C., Chapra—All the ingredients you require may be had of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta.

2802 J.S., Ludhiana—You may consult Manufacture of Soap and Vegetable Oil Industry both the books published from this office, price Rs. 3-7 each including postage.

2803 K.L.S., Calcutta—Collapsible tubes may be had of Metal Box Co. of India Ltd., B2, Hide Road, Kidderpore, Calcutta. Tube filling machines may be had of Industrial Machinery Co., 14, Netaji Subhas Road, Calcutta. The above firm will supply printed tubes. For art printing write to Art Press, 20, British Indian Street, Calcutta and Loyal Art Press, 20, Strand Road, Calcutta.

2804 G.I., Mysore—For foils enquire of Modern Stationery Agency, 14-2, Old China Bazar Street and Golam Akbar Khan & Co., 72, Balakhana Road; both of Calcutta.

2805 P.L.G., Sonipat—For coal and coke you may negotiate with Gillanders Arbuthnot & Co., 8, Netaji Subhas Road; Jardine Henderson & Co., 4, Clive Row and J. C. Dutt & Co., 11, Netaji Subhas Road; all of Calcutta. For cement write to Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road and Dalmia Cement & Paper Marketing Co. Ltd., 9, Dalhousie Square East; both of Calcutta.

2806 M.L.S., Rampura—You may polish slate with Japan black.

2807 E.A.G., Bombay—We have no book on bakelite and celluloid manufacture.

2808 M.P., Delhi—Following is a formula of cement for movie films: Celluloid cut in small pieces 10 parts; acetone 8 parts; methanol 27 parts; benzol 45 parts; methyl cellosolve 10 parts. For use mith movie films, the gelatin emulsion surface is rubbed with sand paper or scraped off with a pen knife. Other celluloid surfaces should preferably be cleaned and slightly roughened. The above liquid is applied with a brush and the moistened surfaces pressed together.

2809 P.R., Kanpur—Toilet articles may be had of Maya Products Co., 10-1A, Nebutola Row; Mira. 11A, Prince Anwarsha Road and Bengal Chemical & Pharmaceutical Works Ltd., 164, Manicktola Main Road; all of Calcutta.

2811 H.K., Amritsar—For screw caps enquire of Topall Works, Lucknow and Fital Cork Co., 153-1, Radha Bazar Street; both of Calcutta.

2822 M.C., Delhi—Following is a formula of grease: Rosin soap 10 lbs.; palm oil 10 lbs.; rosin oil 550 lbs.; strong caustic soda lye 8 lbs. Melt the rosin soap and palm oil together then add the rosin oil and afterwards as much rosin soap as will make the mass of a buttery consistence, then add the soda lye.

2823 J.S.P., Banaras—For dry cell write to National Carbon Co. (India) Ltd., 28, Pollock Street, Calcutta.

2824 S.K.B., Howrah—An article on candle manufacture appeared in May 1949 issue of Industry. If you go through the article you will get all the information required. Process of manufacturing boot polish will be found in Prospective Industry, published from this office, price Rs. 3-7, including postage.

2826 D.D.G., New Delhi—To prepare table salt dissolve lump salt in four times its weight of distilled water, filter and then drop into the filtered solution first a choloride of barium and afterwards carbonate of soda as long as any precipitate falls. then filter and evaporate clear fluid very slowly until crystals begin to appear. When this condition has been reached set aside the solution for a day. The crystals are taken out and dried and kept in bottles. Process of manufacturing fireworks will be found in Home Industries, published from this office, price, Rs. 3-7, including postage.

2827 F.A., Multan City—An article on plastic industry appeared in December 1948 issue of Industry. We have no book on plastic industry.

2828 B.N.R., Rohini—For medical books in Bengali enquire of Gurudas Chatterjee & Sons, 203-1, Cornwallis Street. Calcutta. For machine enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension Calcutta

2829 D.R.A., Puri—We have no book on paper industry. You may refer your query to Forest Research Institute, Dehra Dun.

2843 N.K., Lucknow—Process of manufacturing fountain pen ink, smelling salt and transparent soap will appear in Formula Section in due course.

2844 A.A.G., Dhrapha—Process of manufacturing face powder, cold cream and depilatory powder will be found in Manufacture of Toilet Goods published from this office, price Rs. 4-8, including postage.

2845 M.M.B., Howrah—A good formula of sparkler appeared in September 1949 issue of Industry.

2846 M.S.C., Multan City—Process of manufacturing graphite crucible appeared in March 1949 issue of Industry. For husking machine write to Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta. Used blades, cycle tubes etc. have no industrial use.

2847 V.D.S., Kanpur—Formulas of nail polish and tooth paste will appear in Formula Section in due course. Collapsible tubes may be had of Metal Box Co. of India Ltd., B2, Hide Road, Kidderpore, Calcutta. For trade mark registration you may negotiate with Dutt & Co., 82, Harrison Road, Calcutta.

2848 K.D., Chunar—Wire nail has good prospect and it is profitable too. Wire nail making machines may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta. The above firm will supply the cost of machine and other details you require.

2848(A) R.P.H., No address—You may consult Indian Textile Journal, Surya Mahal, Military Square, Fort, Bombay. You may start mantle manufacture with Rs. 10,000. For machines enquire of W.H. Brady & Co. Ltd., Mercantile Bldg., Lall Bazar, Calcutta. We have no book on camphor manufacture. For dyeing and sizing you may consult Cotton Dyeing and Printing, published from this office, price Rs. 3-7, including postage.

2864 D.J.P., Bombay—In the formula of soap quoted by you increase the quantity of caustic soda to 22 lbs. Then proceed as usual.

2865 I.C., Saurashtra—For mantle knitting machines enquire of W. H. Brady & Co. Ltd., Mercantile Bldg., Lall Bazar, Calcutta. For lux soap write to Lever Bros. (India) Ltd., 9, Lyons Range, Calcutta. Following is a formula of white paint: Zinc oxide 4¼ cwt.; wh barytes 1¼ cwt.; linseed oil 9½ gallons. Mix a paint mill.

2866 H.S., Ajmer — For betelnut cutti machine enquire of Oriental Machinery S plying Agency Ltd., P12, Mission Row Ext sion, Calcutta.

2869 M.L.M., Amritsar — An article plastic industry appeared in December 19 issue of Industry. For spray painting machi you may enquire of Gillanders Arbuthnot Co., Gillander House, 8, Netaji Subhas Ro Calcutta. Process of spray painting w appear in Formula Section in due course.

2871 O.O., Dhrapha—A good recipe pain balm appeared in May 1948 issue of I dustry. Formula of green ink will be found November 1949 issue. An article on cand manufacture appeared in May 1949 issue Industry.

2872 M.Q.M.S.B., Lucknow—Please wr in English.

2873 B.S.K., Saklaspur—Process of charging battery and manufacturing carbo dioxide gas will appear in Formula Section due course.

2874 S.S., Colombo—For denatured spi enquire of Dr. Bose's Laboratory Ltd., 53, Ra Dinendra Street, Calcutta and Scotia Dist lers Ltd., 6, Lyons Range, Calcutta.

2875 D.B., Chabua—Following is a formu of slate pencil: Ground slate 60 parts; grou limestone 30 parts; silicate of soda 10 par Knead the ingredients together into a plast mass and then force through a perforated sla The pencils are next cut into desired sizes wh dry. The shaping is done by laying the pen in a trough, the bottom end being gripped au matically in a holder which revolves at angle and the end is held against a rough sto revolving at high speed in water. Followi is a formula of chalk pencil: Precipitated cha 40 parts; Plaster of paris 45 parts; lithopo 10 parts; glue solution 5.10 parts. Knead together to make a soft dough and pour in gun metal moulds. When set take out an allow to dry in air. Then put all together in tray and moderately bake over mild fire.

2877 R.M.D., Raipur—Reply to your que has been sent by post.

2878 W.W.S., Almora—Reply appears November 1949 issue under No. 2257.

2879 S.R.T.W., Hoshiarpur—Process making pyrethrum flower extract will appe in Formula Section in due course.

2880 H.S., Jullundur City—You may t the following formula of varnish: Nitrocell lose 6 parts; shellac 4 parts; amyl acetate parts; butyl acetate 3 parts; alcohol 1 par ethyl acetate 5 parts.

2881 A.G.F., Bhavnagar—You may co sult Pharmaceutical Preparations and Home I dustries both the books published from th office, price Rs. 3/7/- each including postage.

2882 D.R., Amraoti—Wants to be put touch with the importers of secondhand woo len coats. Please give English equivalent things you require

—REVIEW OF BOOKS

THE PLANNING OF BRITISH COTTON TEXTILE INDUSTRY AFTER WAR by E. B. Joshi. Published by Technical & Commercial Publications, 81, Atkapuri, Baroda. Pages 210, price Rs. 4/8/-.

Himself a textile technologist, Mr. Joshi has written a book which tells the story of the rapid post-war rehabilitation of the British textile industry. The book is a product of the author's six months' study tour in England during which he had the opportunity to spend some time with the well-known works of Messrs. Platt Brothers & Co. Ltd., Oldham, and their associated companies.

Within a short compass Mr. Joshi compresses all useful information on recommendations of the various Committees for post-war reconstruction of the British textile industry, the problems of labour management and training, the wages question, scientific research activities now seriously undertaken, and the improvements recently introduced in the British textile machinery and processes. The chapter dealing with these mechanical improvements is well illustrated.

The author believes that the British textile industry is fast recovering and all efforts are now being made to replace old and much used machinery by new ones so that the rate of production might be increased. It is needless to point out that the British example, this book dilates upon, is worth a very careful study by our own industrialists. Mr. Joshi lays particular emphasis on textile research, recruitment of labour and labour training, and maintenance and replacement of machinery which, he says, must be systematically and scientifically tackled if the textile industry is to survive.

BANKING, PLANNING AND CONSTITUTION MAKING by K. T. Shah. Published by Vora & Co. Ltd., 3, Round Building, Bombay 2. Pages 113, price Rs. 4/8/-.

Prof. K. T. Shah is one of our notable economists. But he has not failed to show his abilities as a very outspoken critic of the present National Government in the course of numerous debates in the Central Parliament and the Constituent Assembly.

The three lectures which form the contents of the present brochure, will no doubt make the readers do some hard thinking on the three subjects they discuss. But throughout the book there is a perceptible amount of the propagandist flare which, perhaps, Prof. Shah could hardly suppress in his prevailing critical mood. The first lecture is a close scrutiny of the Banking legislation and practices in this country. The second explains what should be done to promote planned development of India's national economy. The third is a merciless dissection of the Draft Constitution and most of the criticisms made here are in line with Prof. Shah's numerous diatribes against it on the floor of the Assembly.

INDIAN STATES IN FREE INDIA by Kevalram C. Oza, B.A., LL.B. Published by Vora & Co., 3, Round Building, Kalbadevi Road, Bombay 2.

First published in February 1947 a few months before the transfer of power to India, this book contains much that is out of date. Even so, its utility for its readers will be not be lost altogether. It searchingly analyzes the problem of the Indian States as they stood two years ago and even anticipates, somewhat vaguely though, some of the changes since introduced. For example, the author correctly predicts that Paramountcy would end with the formation of the Indian Union and the Union will automatically be paramount in several respects. As we all know, the Indian States Ministry this year have completed the process of integration of States into the Indian Union and though in the domestic sphere these enjoy some measure of autonomy, the present drift is towards obliterating the differences between States and Provinces so as to bring the former into line with the latter. The author anticipated this change much earlier than now.

The book, however, does not have anything clear and specific to say what should have been done to democratise administration in the States or to mete out a fair deal to their peoples. Integration marks only the beginning, but the progress itself will take a long time to work itself out. It is not a fact that India's numerous feudal princes haye become constitutional monarchs. In some of the Unions and States there is yet no parliamentary democracy and the rights of the princes at most have undergone certain modifications. The economic plight of the States peoples, like their brethren in other parts of India, has not improved in most cases and even deteriorated. The author recognizes the value of Indian princes' role in the task of nation building and holds that in the transitional period their co-operation and assistance should be availed of. The Government of India's policy too is framed upon very the same principle and the States Ministry have even praised the patriotic possibilities of the members of the princely order in general but for whose co-operation the Dominion Govt.'s new dispensation with regard to the States could hardly be implemented at all.

A STUDY OF ECONOMIC PLANS FOR INDIA by D. S. Nag. Published by Hind Kitabs Limited, 261-263, Hornby Road, Bombay. Pages 177, price Rs. 4/8/-.

At a time when literature on planning for prosperity is growing thick and fast in this country this new publication will not be lost in the crowd but carve out a niche for itself by dint of a distinctiveness all its own. The greatest merit of the brochure is its academic aloofness; it is inspired by disinterestedness and objectivity which enable its author to see what is what, the strong points as well as the weak points in the

various plans and schemes which have been formulated by the Government and other public organizations here during the past five years or so. In an age when partisanship accompanied by a rather fanatical fidelity to certain pre-determined patterns of plans has become the usual vogue with our intelligentsia,—a sure sign of the collapse of democracy and the democratic outlook,—it requires real talent and courage to cut oneself adrift from the current fashion and get down to analyzing things in a searching but dispassionate manner. Mr. Nag's book is well worth reading as he has succeeded in doing what most other writers in the line have failed to do.

In the author's own words, the book is "an appraisal of the various plans undertaken in a fact-finding spirit." It starts with an appraisal of the work done by the Congress-sponsored National Planning Committee. The next topic of discussion is the well-known Bombay Plan with its stress on the development of large-scale industries, the need for which the author does not deny but he rightly questions its practicability in the absence of capital goods we have got to procure overseas. The second important plan discussed in the book is M. N. Roy's Peoples Plan which hinges mainly on the speedy nationalization of the means of production,—a proposition which is not feasible immediately. In the course of an examination of the Gandhian Plan, of which Prof. Agarwalla is the pioneer exponent, the author refers to the inaccuracy of the popular belief that Gandhiji was against the development of all large-scale industries. The Gandhian Plan recognizes the importance of certain basic and key industries like (1) Defence industries, (2) Power—Hydro-electric and thermal, (3) Mining, Metallurgy and Forestry, (4) Machinery and Machine tools, (5) Heavy Engineering, and (6) Heavy Chemicals. One principal characteristic of the Gandhian Plan is its emphasis on an exclusive dependence on internal resources and finance for working out the country's economic development.

In the subsequent chapters the book passes on to an examination of the report of the Planning Advisory Board, the economic policy of the interim Government, and the new industrial policy of the Government announced on April 6, 1948. Discussing the connexion between planning and national unity the author emphasizes the paramount need for a strong Centre. As for the new industrial policy, the author's main conclusions are: (1) that the Government's attitude towards nationalization is half-hearted; (2) that the Government's new method of settling disputes between Labour and Capital through arbitration by tribunals appointed by them presupposes the existence of an organized trade union movement on the one hand and an enlightened employer class on the other, but the fact is that we have got neither in this country as yet; and (3) that very meagre interest has been shown in the development of our rural and cottage industries which form part and parcel of the Indian national economy.

ation and the need for a harmonious develo[pment]. of our rural and urban economic[s]. With regard to nationalization the author warn[s] that nothing should be done in a huff, but tha[t it] should not lend countenance to the excuse tha[t] nationalization may involve considerable spe[]culative risk. The author advocates a cautio[us] policy of limited nationalization. In th[is] country's economy there is a well-assured plac[e] for large-scale industries alongside of the sma[l]ler cottage industries. Our economic develop[]ment should not be lop-sided but balanced an[d] this means a well-co-ordinated development [of] our rural and urban economic. The thre[e] principal objectives of planning should be (1) an irreducible national minimum with a pro[]gressively rising scale of amenities and com[]forts, (2) national self-sufficiency, and (3) organized defence. The author is right i[n] maintaining that the crux of planning lies no[t] in formulating the objectives. It must indica[te] what to do and how to do it. The book i[s] rounded off with four appendices which contai[n] four important recent documents relating t[o] planning.

NOTICES & REVIEWS

(Manufacturers sending specimens an[d] samples of their products for notice and revie[w] may please note that no notice is published [of] medical preparations and allied substances i[n] this sections.)

CALENDARS

We have received two pictorial calendar[s] from Kamani Chemical Ring Merchants Co[.] Gali Pir Panch, Mathura, U.P.

ALUMINIUM NAMEPLATES

We are glad to receive a couple of nicel[y] embossed nameplates from Butla, 1st Floo[r] Rashid Building, 73, Colootola Street, Calcutta

HARMONIUM REED

We have received from Nath Trading Com[]pany, Nai Basti, Gur Mandi, Delhi a sample o[f] harmonium reed named "German tune."

TRADE ENQUIRIES

(To communicate with any party write t[o] him direct with name and address given belo[w] mentioning Industry).

2607 A. K. Pillai, 125, 41st Street Rangoo[n] —Wants to be put in touch with the dried se[a] prawns in India.

2630 R. Kunwar Sen, K3492, Seetlagall[i] Agra—Can supply peacock feather flux (tass and peacock feather in large quantity.

2688 Rajendra Kumar Banarsi, Chhin[d]wara, C.P.—Wants to be put in touch with th[e] purchasers of eggs on wholesale.

2761 Gupta Trading Co., Kanungoya Street, Meerut—Want to be put in touch wit[h] the dealers in scissors at Singapore, Rangoo[n] Hongkong, Africa and Afghanisthan.

2876 Leads & Sons, Nizamabad, Punjab— Want to be put in touch with the suppliers o[f]

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Industry Year Book and Directory, 1949-50 with Classified Lists of **Trades & Industries, Newspapers,** etc. -- -- -- Rs. 15-0

Theory & Practice of Commerce and Business Organisation By J. C. Mitra F.S.S. (London), F.R.E.S. -- Rs. 12-0

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THLY MAGAZINE FOR MANUFACTURERS & BUSINESSMEN

CALCUTTA, JANUARY, 1950. No.

INDUSTRY.

A Monthly Magazine for Manufacturers and Businessmen.

Published in the first week of the month by INDUSTRY PUBLISHERS LTD., 22, R. G. Kar Road, Calcutta-4.

EDITORIAL CONTENTS FOR JANUARY, 1950

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All enquiries regarding industrial or business information should be addressed to the Editor. Contributions and articles for review and notice should also be sent to him.

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Editorial Department: 11 A.M. to 4 P.M. on weekdays and 11 A.M. to 2 P.M. on Saturdays.

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For "Organisers and Agents" on suitable terms, apply Oriental Provident Insurance Ltd. 28, Canning Street, Calcutta. Phone Cal. 7175. 156 AA

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Wanted Agents and Stockists for our Perfumeries and Patent Medicines terms attractive. Digambra Chemical Works Champa (Bilaspur), C.P. 40 AA

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For Selling Dr. Paul's Lotus Honey. Apply S. Paul & Co., 4, Hospital Street Calcutta—13. 15 AA

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Wanted canvassers for securing orders for metal labels, advertising novelties, plastic name plates etc. Apply: Excel Process Works, Opp. Delisle Road, P.O. Bombay 13. 67 AA

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For any & every kind of Springs Consult:— Young Graduate & Co., (Spring-washers Specialists Suppliers to.—Government, Railways, Mills Corporation etc., 126-C, Dharamtala Street, Calcutta—13, Phone:—Central 2412. 4 SR

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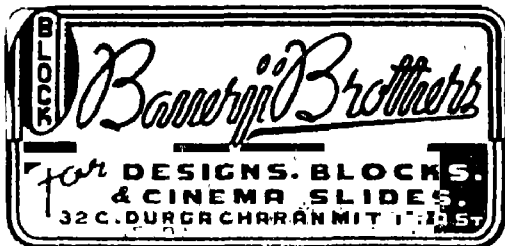
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EDITOR:
K. N. BANERJEE.

VOL. XL. CALCUTTA, JANUARY, 1950. No. 478.

DEVELOPMENT OF SCIENTIFIC MANPOWER

IN India to-day there is a tremendous dearth of scientific and technical talent. Well-trained technical personnel are so very rare in this country that we can hardly afford to dispense with foreign help in technical skill at the present stage.

But this dependence on foreign help cannot be allowed to continue indefinitely. Soon or late the country will have to raise its own corps of skilled technical personnel, its own scientists, engineers and technologists. That this important problem is receiving due attention is demonstrated by the fact that the Government is now considering the recommendations of the Scientific Manpower Committee whose final report has already been submitted.

The recommendations of the Scientific Manpower Committee rightly condemn communalism in education and urge its speedy elimination. The Committee's emphasis on the need for the creation of a central scientific and technical service on the lines of administrative and other all-India services, seems appropriate. This will most surely eliminate the disparity of privileges between technical and administrative personnel and so provide an impetus to our meritorious students to undergo higher technical training.

Mere theoretical knowledge which cannot be put to practical use will spell no good either for the country or its possessor. Hence the Committee recommends the adoption of urgent and far-reaching measures to make available existing facilities for practical training to as many qualified students as possible.

The Committee also recommends that all factories or industrial establishments should sponsor schemes of practical training, and expenditure on this account should be regarded legitimate expenditure of the establishment.

It may be argued, what is the utility of opening out facilities for higher technical training so long as the trainees cannot be guaranteed employment on reasonable terms after the conclusion of their training ? This is a very pertinent question and so long as planned economic development is not undertaken in the country, the scientific manpower, even if skilled and fully trained, can hardly be utilized adequately.

AGRICULTURAL RESEARCH.

When last month a periodic review of the activities of the Indian Council of Agricultural Research was made by the Council's Advisory Board, Sardar Datar Singh, Vice-Chairman of the Council referred to a previous decision of the Governing Body of the Council, relating to the setting up of committees for scrutinizing research on a regional basis. He said that regional committees had been set up in accordance with this decision, both for agriculture and animal husbandry and this had eliminated considerably duplication and overlapping in research work.

Altogether 42 new research schemes were sanctioned in 1948-49 and 71 current schemes were extended. Among the schemes there are the ones that deal with introduction of milk yielding trees, silage making, improvement of tuber crops, methods of analysis of milk, and village development work in Delhi.

A compresensive wheat rust control scheme has been evolved and under this scheme new varieties of wheat resistant to rust will be grown. The Council has also evolved high yielding strains of pulses and millets.

The Council is reported to have made an interesting experiment on the animal husbandry side. The incidence of tuberculosis among cattle and sheep at the livestock farm at Hissar was examined and experiments undertaken have shown that the intensity can be reduced from 20 per cent. to 1 per cent. by regular testing and segregation of the affected cattle.

On the dairy research side, investigations are being conducted on the preparation of a "tamper-proof can" for distribution of milk.

From the above it is abundantly clear that the Council is now carrying on research work the results of which can be made over to agricultural use for a successful liquidation of the country's shortage of foodgrains and other food materials as also for the prevention of wastage through rust and pestilence of cattle and sheep could hardly be overemphasized in agricultural economy and it, therefore, seems heartening to note that the Council of Agricultural Research is now considering how best to deal with the problem of cattle diseases.

How serious is the menace of wheat rust in India to-day can be guessed from the revelations made by Prof. Karam Chand Mehta in the course of a speech at the 32nd anniversary celebrations of the Bose Institute, Calcutta last month. According to Prof. Mehta, India loses annually Rs. 20 crores through damage to wheat and barley by rust epidemics (this amount is on the basis of the current ruling prices of the two crops). In case of the epidemic spreading over danger areas the loss may run far higher upto Rs. 40 or even Rs. 60 crores, as happened in 1947. Prof. Mehta held that "the best method of controlling rust in the long run would be to cultivate varieties resistant to the disease." The Council of Agricultural Research also takes the same line and is in favour of evolving new disease-resistant varieties of wheat. As a short-term measure, Prof. Mehta said, it was necessary to prohibit the growing of summer crops in the hills, hilly tracts and plains in order to check the early outbreak of the disease in that part of the country.

RURAL UNEMPLOYMENT.

According to the Study Group on economic aspects of Rural Adult Educa-

tion, the low standard of living in Asia is largely due to the under-employment of its agricultural population. The Study Group, in the course of a memorandum to the Mysore Unesco Seminar, points out that in order to reduce rural unemployment there is the need to introduce and re-introduce rural and cottage industries and improve the already existing ones.

The main recommendations of the Group include: (1) a comprehensive survey by experts of the rural community's primary needs; (2) rural or cottage industries to be established to meet these needs in order of priority; (3) in the choice of such industries self-sufficiency of the village should first be aimed at; in general, no attempt should be made to compete with large-scale urban industries using mass production methods; (4) in order to further achieve self-sufficiency subsidiary occupation should be found to provide work during periods of seasonal unemployment; (5) training centres are required for training workers to produce goods; (6) these centres should also be community centres. Schools could well be used. All centres should also serve as rural marketing agencies and supervise the standard products.

In our country where agriculture has remained the occupation of a vast majority of the people through ages some attention is now being bestowed on the question of industrialization. This is undoubtedly an encouraging phenomenon. But for the matter of that we hardly can forget the fact that Indian economy despite all efforts to industrialize it is bound to remain agricultural due to the country's peculiar physical conditions. While, therefore, doing all we can to go ahead with the task of urbanization, let us not ignore the needs of our millions of village folk. The work of cultivation cannot last throughout the year and to provide employment to the rural folk in the off-season we have to make a substantial addition to our already existing cottage and small industries. Technical innovations too will be needed to help these turn out goods more efficiently than now. The recommendations mentioned in the above paragraph have not come a day too soon. Action on the lines suggested is necessary to revitalize our decadent village economy and to promote the economic development of the entire country by co-ordinating the two economies, rural and urban.

SYNTHETIC RICE.

A report appearing in the December issue of AUSTRAL NEWS says that the Western Australian Government has decided to buy from the Federal Government a power alcohol distillery built during the war years at Collie, W.A., and to use the plant to convert wheat into synthetic rice. It goes on to say that if the proposals reach fruition, 79,000 tons of wheat will annually be processed, and from it 51,600 tons of synthetic rice, 2,400 tons of ordinary bran, and 15,000 tons of high quality cooked bran produced. Giving details about the projected manufacture the Report adds that processing of wheat into rice consists of washing and cleaning the grain, which is then subjected to repeated steamings with steam at 20 lb. a square-inch pressure. Effect of this is to distil off fatty acids and remove the characteristic wheat flavour and aroma. The steamed wheat is then vacuum-dried until a hard gelatinised mass is produced, and the individual grains are casehardened so that they will be resistant to breaking up and cracking when milled. Outside husk is then removed in an ordinary rice mill and the product packed for shipment. Synthetic rice produced by the method is resistant to weevils, rancidity is greatly retarded, and the grain has almost the same vitamin content as wheat. It cooks like rice and

does not go mushy with prolonged cooking.

COFFEE, A NUTRITIVE FOOD ?

The popular belief is that coffee is a nice stimulating beverage. But some time ago the Minister for Public Works, Madras, inaugurating the Second All-India Conference of The Indian Coffee Board Labour Union, said that the Director of the Nutrition Research at Coonoor had told him that coffee possessed a highly valuable nutritive element, not usually to be found in many other articles of food. Coffee, as we know, contains a good lot of caffeine and so excessive coffee drinking is usually regarded as injurious to health. But as the statement of the Madras Minister shows, coffee may possess high nutritive values. The public should like to know what exactly these nutritive values are in order to be sure that a large consumption of coffee will do no injury to their health. The traders and the growers too should be equally interested in the matter, for if to coffee can be really attributed certain high nutritive values, that will most surely lead to its increased production and sale on account of a rise in demand. At present coffee is drunk much more abundantly in the South than in the North. Recent reports indicate the use of coffee in the South has increased further and become common in the villages. As revealed by the Madras Minister, after the forced introduction of prohibition some of the addicts to drinking have started drinking coffee. Indian coffee is very good in quality and it ought to find its way into the export market more abundantly than now so that it could prove to be a good earner of foreign exchange.

MACHINE TOOL FACTORY.

Hon'ble Dr. S. P. Mookerjee's recent announcement that the Government of India has decided to establish its machine tool factory in the Mysore State will be welcomed by all interested in this country's industrialization. Altogether eight factories will be set up. The location of these at Badravati, Jalahalli and Whitefield—all in Mysore State—has been decided upon due to several encouraging factors. These are proximity to a fully equipped iron and steel works, equable climate, and water facilities from the rivers Tunga and Bhadra with 2,500 acres of elevated land where the labour colony can be built. The total cost of the scheme is estimated at Rs. 15 to Rs. 18 crores and the construction of the factory will be spread over five years involving three stages.

It is reported that the Government of India has recently entered into an agreement with a Swiss firm for the establishment of the factory. The Swiss Company will subscribe to 10 per cent. of the share capital, but the Government of India reserves the right to buy the shares of the Swiss firm at agreed rates after 20 years.

When the scheme is implemented, the Mysore factory will turn out machine tools worth about Rs. 8 crores annually. Besides, it will repair and recondition old machinery worth about Rs. 25 to Rs. 30 crores. From these estimates it is obvious that both by putting out new machines and repairing old ones, the Mysore factory will reduce our dollar expenditure and dependence on foreign machineries to a perceptible extent.

EXPORTS TO DOLLAR AREA.

Recent reports reveal encouragingly enough that India's exports to hard currency including the U.S.A. are steadily rising while the grip on established markets remains unrelaxed. It is said that the exports of tea, spices, manganese ore and cashewnuts are definitely on the upgrade.

A PTI message from Delhi gives the following useful details from which an idea of the recent trends in India's export trade can be formed:—

India exported to the U.S.A. and other hard currency areas 16,500 tons of tea in 1948. The corresponding figure for only nine months of this year (January-September) was 15,374 tons. This improved export position was largely due to better quality and lower prices.

"Export of spices have already reached a record figure this year. While 4,159 tons were exported in 1948, the January-September figure this year was 4,512 tons. Manganese ore exports in the first three quarters of this year amounted to more than 200,000 tons against 182,000 tons the whole of 1948.

"India's mica exports last year touched the highest level for any 12-month period—12,208 tons. Fruits and vegetables, mainly cashewnuts, to the value of Rs. 434 lakhs were exported to hard currency areas last year. In January-October of this year, the figure reached Rs. 344 lakhs."

FOOD SELF-SUFFICIENCY.

Prime Minister, Pandit Nehru once again reiterated last month the determination of his Government that whatever might happen India should achieve self-sufficiency in food by the end of 1951 and that after that year there would be no further import of food except in case of a very grave emergency. Some time ago a food Conference of Provincial and State Government officials was convened in Delhi under the auspices of the Central Agriculture Ministry and the officials participating in it unreservedly subscribed to the Central Government's determination to stop food imports after 1951.

There has been some uniformed criticism in a section of the Press that the Government has got only a target, which is self-sufficiency in food and a date by which the target has to be achieved, bu[t] no concrete plan or programme to be fol[-]lowed for the realization of this necessar[y] objective. In answer to this it may b[e] pointed out that though the Governmen[t] has not yet come out with a concrete an[d] detailed food programme, the general out[-]lines of it are available. For example, fou[r] measures have been recommended to sup[-]plement the steps already taken. Thes[e] are: Legislation to bring fallow land[s] under cultivation, formation of large eco[-]nomic agricultural units, compulsor[y] preparation of composts by municipalitie[s] and setting up of a Central plant protec[-]tion machinery to fight plant pests an[d] diseases.

Merely requesting owners to brin[g] fallow lands under cultivation can hardl[y] have the desired effect and, therefor[e] legislation seems necessary to enable the Government to acquire certain specia[l] powers to compel owners of fallow lan[d] to bring it under the plough. If, however, they plead inability to do so, the Government may take over possession of such lands and make them over to cultivators willing to utilize them.

One of the main evils of our agricultural system is the existence of a large number of fragmented holdings which renders cultivation thoroughly uneconomic. Consolidation of these is thus required to push up their yield of produce. For the time being, however, it has been decided to confine the scheme of consolidation to lands reclaimed by the Government. Of course, simultaneous efforts will be made to encourage the growth of co-operative farming. Since cultivation of crops is only a seasonal occupation, the farmers will be given scope for subsidiary occupation in the off-seasons by linking co-operative farming with the establishment of rural industries.

Prevention of wastage of food grains through pests and diseases and the preparation of indigenous manures, the two

other measures recommended in the Delhi Conference last month—deserve careful consideration. At present huge quantities of urban refuse and other waste matters are allowed to run to waste and if the municipalities undertake the preparation of manures from these materials one of the drawbacks of our agriculture, namely, the shortage of composts and fertilizers, will have been removed to a very large extent. If the import of fertilizers is stopped—and at present the prospects of it are not bright—the country's reserves of foreign exchange will have been conserved. In our view, the Delhi Food Conference has done well in recommending the maximum use of indigenous manures such as composts in the place of artificial manures which have to be imported from abroad. There is no dearth in the country of nitrogenous and phosphatic manures such as groundnut cakes, bonemeal and bloodmeal.

EFFICIENCY OF LABOUR.

Towards the end of November last the West Bengal Branch of the Indian Conference of Social Work met in Calcutta to discuss the various problem of the country's industrial workers. The meeting drew attention to a very serious problem now facing industries and this is the gradually waning efficiency of labour. The workers to-day seem to be in a very cheerless mood and under pressure of the hard realities which stare them in the face they are losing all incentive to work and produce more. The Calcutta Conference of Social Workers showed a keen awareness of the implications of this drift towards inertia and asked the Government to give more attention to social insurance schemes, industrial housing, adult education and effective price control measures to fight inflation and raise the people's standard of living. Trade Unionists were asked to educate labouring classes in the simple laws of trade unionism, and employers to take steps to promote the growth of better relations between themselves and their employees.

—POULTRY FARMING

POULTRY farming on scientific lines is one of the healthiest and most agreeable of occupations. It can be carried out under ideal surroundings and in return gives a reasonable living. Many who are hankering for entering into services under government or mercantile firms may find it not only suitable but lucrative.

Many people have failed in their attempts to keep poultry. Often they have blamed the country, sometimes they have blamed the fowls, but seldom have they blamed themselves. The man or woman who intends to take up poultry as profession and expects to make a success of it must have its real interest at heart. It is essential to have had some experience before venturing out alone. The best way to acquire knowledge is by experience, but it is not at all necessary that the beginner should have to gain this by means of losses and disappointments.

Going into the poultry business is just the same as starting any other kind of business and it cannot be built in a day. It takes time and work to build up any business and this is also true of poultry. The trouble is that the beginner gets too enthusiastic and wants to start on a big scale and seems to have the idea that anyone can be successful in the venture. This fact has been disproved time and again. The only way to get success in the poultry business or any business for the matter of that, is to start on a very small scale and with experience, to gradually increase the business. Starting on a small scale and gaining in practical experience are the *sine qua non* of success in the poultry business.

Before making a large investment it is necessary to study thoroughly all conditions relating to the business. A good plan for the beginner would be to secure a position with some successful poultryman. Thus he can study not only the poultry and their habits, but also their methods of caring for the birds and marketing them. If it is impossible to work with a poultry concern, then it is better to go into the business on a small scale.

It is our aim to ventilate the informations in this connection as far as practicable whereby the new entrants in this field may get first hand instruction to start this industry with success.

SELECTION OF BREEDS.

There are many breeds of fowls. Some are beautiful ornamental birds, well worthy the attention of fanciers who can afford to keep them for mere show. Some are both beautiful and useful birds, and can be kept profitably with ordinary care and economy. Some are very delicate birds, others again, are hardy and not only thrive well but multiply rapidly.

So to select a favourite or two from the many available breeds appears at first sight to be a formidable task, the purpose for which one intends to keep fowls will go a long way in helping one to arrive at a decision.

Exhibition poultry breeding is confined to the breeding of fowls for show purposes. strict attention being paid to the proper matings to produce the right colour, marking and type. This branch of poultry farming is most difficult and requires years of study and knowledge of the laws of breeding to produce the proper results.

Utility poultry breeding is confined to the breeding of pure breed poultry but in which less attention is paid to the requirements of the show standard and

more attention is paid to breeding for egg production, or birds for table purposes, or both combined. Wherever possible, both utility and exhibition qualities are to be aimed at but usefulness and productiveness are paramount in the utility side.

Cross-breed fowls, or the progeny of two distinct varieties can also be included in utility poultry keeping.

Mongrels are fowls that are allowed to mate indiscriminately year after year. These fowls are useless in every way.

For Eggs only—Practically all the Mediterraneans, but preferably the single comb white, or black Leghorn for large or small flocks, the Ancona and Minorca for small flocks, the Barnevelder, and Langshan for those who wish to specialise in dark brown eggs.

Some strains of Leghorns and Minorcas lay the largest eggs, but the eggs of the other breeds mentioned are of good size also. It is not the largest birds that lay the largest eggs.

THE BEST TABLE FOWLS IN ORDER OF MERIT.

(1) The Indian Game, (2) Chittagong, (3) Langshan, (4) Wyandotte, (5) Rock, (6) Orpington, (7) Sussex, (8) Rhode Island Red.

THE LARGEST AND THE MOST WEIGHTY BIRDS.

(1) Brahma, (2) Langshan, (3) Orpington, (4) Rock, (5) Chittagong, (6) Wyandotte, (7) Game, (8) Cochin, (9) Sussex, (10) Rhode Island Red.

THE MOST HARDY FOWLS.

(1) Brahma, (2) Langshan, (3) Chittagong, (4) Orpington, (5) Rock, (6) Wyandotte, (7) Sussex, (8) Cochin, (9) Game, (10) Rhode Island Red.

THE BEST MOTHERS AND SITTERS.

Silkies Wyandottes and some Bantams are the best sitters and mothers. The Brahma, Cochin, Orpington, Rock, and Langshan are excellent sitters and mothers, but they are very heavy, and apt to be clumsy, and destroy their eggs and chickens. The Game and Chittagong are splendid sitters and mothers, but they will kill all the other chickens and wound all the other hens in the yard if not carefully watched. The common country hen, called the Pati, is, as a rule, the best mother of all fowls. All hens of the same breed are not equally good mothers. They differ in this as much as in other qualities.

FOWLS SUITED TO LIMITED SPACE.

(1) Brahma, (2) Cochin, (3) Orpington, (4) Rhode Island Red.

THE BEST FOWLS TO KEEP FOR GENERAL HOUSEHOLD PURPOSES.

The Leghorn, Chittagong, Wyandotte, Langshan, Orpington, and Rhode Island Red are the best birds to keep for eggs and table use.

Among the various types of fowls mentioned above there are really only two or three pure breeds of fowls indigenous to India. The first is the Chittagong breed, and the other is the Aseel, and in Western India the Busra fowl. There is a large number of fowls of different sizes, shapes and colours to be found all over India. These are for the most part very much like the jungle fowl. Their size and shape vary according to the locality in which they have been raised and the care with which they have been bred, some of them have Chittagong, Aseel, Langshan, Brahma or Orpington blood infused into them, and are better in size and quality than the common ones.

The common Indian moorgi, as found in all parts of this country, is of very little value as a layer or table bird.

Those that have been produced by a cross with the Chittagong and Aseel are

larger birds, and find a good market in Calcutta and other cities and towns in India. A cross between the Chittagong cock and the common hen will produce very fair table birds, and a cross between the Langshan, Rhode Island Red, Wyandotte or Orpington cock and the common hen will produce very fair layers.

BRIEF DESCRIPTIONS OF DIFFERENT BREEDS.

Since there are many breeds and varieties of fowls to be found in India and elsewhere let us study for a moment some of the breeds which are profitable to keep.

BRAHMAS.

This is the most prominent of all breeds of fowls. It is valued for its great size and hardiness, and for its being a good layer of rather large-sized and rich eggs. Their flesh is not first class, but fairly good when the bird is 4 to 6 months old. As a family fowl they are unequalled. They are very handsome birds, majestic in appearance, having heavily feathered legs, though less so than Cochin.

COCHIN.

The Cochins somewhat resemble the Brahma in shape and general appearance but is rounder and more fluffy. The hens are good layers, and good sitters and mothers, but are very clumsy and apt to break their eggs and crushed their chickens. They are very quiet and tame, and can be kept in a small run.

Cochins are not very good table fowls; their flesh is rather coarse after they are six months old; but their eggs are very rich, and usually of a fair size.

They grow to a large size. The cocks should weigh from 8 to 11 lbs., and the hens from 7 to 9 lbs.

There are five leading varieties of Cochins: The Buff, Partridge, Cuckoo, White and Black. The Buff and the White are the handsomest.

LANGSHAN.

The Langshan is a very handsome and useful bird. It is one of the best all-round fowls to be found. The hen is a good layer, and splendid sitter and mother. A good strain of this breed cannot be excelled by any other breed as layers. These birds need a good deal of liberty or large runs. There are four varieties of this breed—the Black, the Buff, the White, and the Blue.

1. A Pair of Plymouth Rocks.

ROCKS.

Rocks are very handsome and useful birds. They have plenty of good-flavoured flesh, and are good layers. They are capital sitters and mothers, and are quiet and tame. They are hardy, and can be kept within a five-feet high fence in rather large runs. The chickens are hardy and mature early. These birds are sometimes bred to a great size, but, as a rule, cocks should weigh from 8 to 11 lbs. and hens from 7 to 9 lbs. They are of a compact and square build with broad breast.

WYANDOTTE.

The Wyandotte is a good breed of fowls. They are good table birds and layers. They are very good sitters and are very hardy when mature.

The comb of this type of fowl must be rose coloured with a good spike, and closely fitting to the head; the beak should

be yellow; the breast deep and broad; the legs rather short, of a bright yellow colour, and free from feathers. In shape it resembles the Rock.

The Wyandotte is an American breed of fowl obtained from crossing the Brahma the Silver-laced Hamburg, and the Indian Game or Chittagong fowl. Their chickens are delicate when hatched and need great care. They should not be mixed with chickens of other breeds, but kept separate with the mother.

INDIAN GAME OR ASEEL.

This is an Indian bird, but is also found in England; the best birds are to be seen in Hyderabad, Deccan and in Mysore, and parts of Northern India. They are hard, close feathered, and heavier than they would appear to be. The comb is small and pea-shaped, and breast very broad. The tail is light; dropping slightly; small, and of medium length.

Their colour is black, white, black-red, or mottled, the last being a handsome showy colour, though the blacks are very lustrous and brilliant.

They are hardy and good table birds. They are persistently pulgilistic, and fight at an early age, and are moderate layers of tinted eggs.

MALAY OR CHITTAGONG.

These birds are bred in Chittagong, but their place of origin is the Malay Peninsula. They are generally called Chittagong. These fowls are also called "Deang Fowls" as the best specimens are bred in a place in Chittagong called "Deang". They can also be got in Bodalpara and Anwara in Chittagong.

They are very large birds; the cocks sometimes measure two feet six inches from beak to toe, and weigh from 8 to 10 lbs.; the hens weigh from 6 to 9 lbs.

The flesh of the Chittagong fowl is excellent. The hens lay well, but are not very good mothers on account of their quarrelsome nature. If each hen is kept alone with her chickens, she will do splendidly and protect them from all intruders. Adult birds are very hardy, but do not bear confinement well. They do best when given a free range. They are very quarrelsome, and when kept in confinement need a high fence to keep them in. The chickens for the first month are not very hardy, and need much care: but they become very strong when they grow to be about three months old. The chickens will not stand confinement and pampering. If given their liberty from the second or third day after they are hatched, fed judiciously, and kept out of damp and wet, they will do very well. They need some extra animal food. The best time to raise Chittagong chickens is February and March, and from July to September, when there is plenty of green grass and animal food about the place. Chittagongs grow rapidly and make excellent birds for the table. The chickens should be reared by themselves, and not mixed with chickens of other breeds.

The Chittagong is easily recognised, the distinguishing features being a small pea-comb, not unlike a soft protuberance overspread with small warts; a long yellow beak and long head; small red wattles, which are hardly visible in the hen; small red ear-lobes, in some cases mingled with white; prominent eyebrows shading eyes of white or yellow; a long neck surrounding broad shoulders and deep chest; wings high and projecting at the shoulders like the arms of a prize-fighter; back sloping to the tail which in the male should droop. Their plumage consists of small feathers set close and of a brilliant sheen. Legs yellow, straight, strong and featherless.

Indians do not breed to any particular strain and good birds are therefore available in all colours, such as Buff,

White, Black, Dark-Brown and Grey, but the Buff or Light Yellow is recognised to be the best type. It would take years of scientific breeding to get a particular strain.

The points of the Buff are: In cocks, the colour buff or gold, with hackle and saddle of a brighter hue; tail and wing primaries ashgrey or white tipped with green; sickle ash-grey or black with yellow lacing: coverts ash-grey or black with yellow border. In hens, the colour buff or yellow; tail and wing primaries ash-grey or white; some ash-grey feathers at the back of the neck and hackle and sometimes a little black or ash-grey in the tail feathers and primaries.

The Whites should be all white with yellow beaks and legs; the Greys are similar in colouring to the Light or Dark Brahma.

GHAGHUS FOWLS.

The Ghaghus is a peculiar Indian breed. In shape and appearance they are very much like the Faverolle, but without feathers on the legs. They are good table fowls, and fair layers. They are hardy, but will not bear confinement. They are good sitters and mothers.

The comb is either single or pea and small; the wattles and ear-lobes small; neck thick; throat loose and baggy; some have whiskers and beards; the body large and rather square; the legs rather long, smoky-yellow or greenish; both the cocks and hens grow very large. They are of various colours—red, brown, black and grey. We believe this breed was produced from a cross between the Malay or the Indian Game and the Brahma or Langshan and Houdan. The Ghaghus is becoming very scarce, and is not often seen now-a-days. The best specimens can be procured from the Gipsy Nomads who wander over India, especially in the Deccan, Mysore and Sind.

The Orpington is a most useful bird —a good table bird and an excellent layer—two qualities that are very seldom found in any one breed.

2. Poultry House.

There are now three distinct popular varieties of this breed—the Black, the Buff, and the White. The Black variety has been produced by crossing together the Barred Rock, the Black Clean-legged Langshan, and the Black Minorca. It is very much like the Langshan in shape, size and laying and table qualities, but is without feathers on the legs, somewhat rounder in make and shorter in leg. The colour should be exactly that of the Black Langshan, i.e., pure black with a glossy green or purple sheen.

The Buff Orpington has been produced by crossing the Buff Cochin, the Golden Hamburg and the coloured Dorking. There is also now Malay blood in it. The colour of the Buffs should be that of the Buff Cochin. In size, shape and useful qualities the Buffs are equal to the Blacks. The Buffs are considered better layers.

The Whites have been produced by crossing the White Rock, White Dorking, White Leghorn, and White Langshan or the White Surrey fowl.

RHODE ISLAND REDS

This is an American breed. They are of various shades of red, and there are both single and rose combs. They are hardy and good layers and table birds. A good strain of these birds will lay as well as the Wyandottes. In size they are as large as the Wyandottes, some are larger.

LEGHORNS

This breed is of Italian or Continental origin. Their bodies are small and compact, and they have a spruce pleasing appearance.

They are of several colours, are splendid layers of fairly good sized eggs. They are hardy and bear confinement well. White Leghorns are the best layers, and lay the largest eggs of this breed of fowls. A most remunerative breed of fowls are these for their eggs, as they are non-sitters.

BANTAMS

There are a great variety of Bantams, all of them being miniature specimens of almost every breed of fowls, now being, as it were, manufactured throughout England. These have not found their way to India yet, where only the Chinese and Japanese varieties may generally be seen.

3. Trap Nests.

SILKIES

Very peculiar birds on account of their plumage, which is more like down than feathers. Feathers are connected by a barb-like filament; this in the Silkies is wanting. They are small birds, of compact Cochin-like appearance, are capital sitters and good mothers, and are fairly hardy on a dry soil.

ORPINGTONS

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The Whites have been produced by crossing the White Rock, White Dorking, White Leghorn, and White Langshan or the White Surrey fowl.

MINORCA

The Minorcas are in many places known by the name of "Red-faced Spanish", and are the nearest, in shape and appearance, to the Black Spanish of all varieties of fowls. It is probable that the two races were originally one, and that the faces then were red, as the Minorcas

now have them; but the Spanish have been bred with white faces, and spoiled by too fine breeding. The shape is like the Leghorn, but the comb is larger, and there is the red face, the white ear-lobes, and the clean legs. There are two colours, the blacks and the whites, but the latter are very little seen. The metallic black plumage of the blacks makes them very handsome, and they are, for the same reason, very suitable for keeping in towns or in such districts as are not over-clean, from the proximity of factories or works of any kind. As layers, Minorcas are one of the best small breeds we have at present; they are capital foragers and small eaters. They are very good layers when given free range. They lay very large white eggs and a great number of them. The chickens grow quickly, and the young cockerels can be eaten with relish, when three months old. They are amongst the best fowls to be found in India, and are rapidly growing in favour, as they do well both in the plains and the hills.

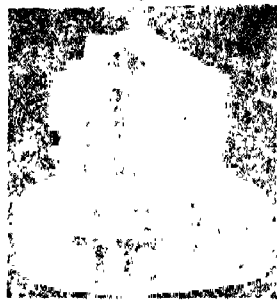
LOCATION OF POULTRY SITE

In tropical country like India poultry can be kept with varied success but that part of the country where the soil is sandy, and mainly of *Kunkar*, with a good proportion of chalk or lime in it, and with a natural drainage, is admirably suited for rearing of fowls. The more elevated, porous and well-drained soil is the best adapted place for this.

Stony ground, however, is not good for fowls as it hurts their feet. But the moist, heavy soil is the worse for keeping fowls. The marshy and dirty grounds are fatal to fowls. The hilly place with less rainfall makes an ideal poultry farm.

POULTRY HOUSE

After the selection of site it is advisble to build up the sheds for the poultry. The runs and houses will be large or small according to the number of fowls to be kept, and must on no account be overcrowded more so in the plains where the weather is warm.

The methods to be adopted in the construction of poultry houses depend more upon locality and climatic conditions. In the hills, warmth and shelter from rain and wind are desirable. In the plains fowl houses require to be cool in summer and warm in winter.

4. Dry Feeder for Young Chicks.

Size of house, of course, depends upon the number of birds to be kept. A house 10 ft. long by 10 ft. deep, and 6 ft. high would hold 25 full grown birds providing each bird 4 sq. ft. of floor space and 24 cu. ft. of air space. A square house is always the most economical shape it provides the maximum amount of room for the minimum outlay on materials.

The houses are generally built of wood and wirenetting; with a roof of wood covered with corrugated iron or rooffing felt. Some are more elaborately built of brick or stone, with tiled roof. The latter type is more durable, but both are far from being ideal, as they provide safe hiding places for the fowl tick. It is almost impossible to rid a pucca building of ticks, but a wooden house can be taken to pieces, treated, and put together again; although it will of course wear it out quickly, if these methods have frequently to be adopted.

Corrugated iron is not a good housing material, it is unbearably hot in the summer and cold in winter. It also "sweats" at night, the moisture in the fowls' breath strikes the cold metal and condenses, dripping on to the birds and the floor.

It is all right to use iron roofs if thatches are placed over them.

The ideal house would have no wood in its structure at all, except the interior fittings, such as the nest boxes, perches and dropping boards, and these would all be movable. The house would stand on a platform on a high ground.

If by chance the houses are infested with ticks, they should be dealt with in the following manner. Put freshly slaked lime all round the edges of the concrete platform, and take nothing out of the house. Ticks will not cross lime or fresh coal tar and if you take nothing out of the house you will not drop ticks into the runs.

The whole of the interior fittings, and the whole of the house, every crack, corner and crevice can then be thoroughly treated with a painter's blow lamp, and without fear of fire or danger to the house.

The floor of the poultry house should be pucca made of portland cement, which can be kept clean, being washed occasionally at least once a week; though they must be swept every morning regularly.

5. **Watering Device.**

The water trough should be fixed outside the house, in the front, at about six inches above the floor level, with a canopy just above it to shade it from the sun, and the birds drink from inside the house through sloes about five inches high and three inches wide, which are built into the front of the houses at the same height as the trough. The trough is filled from outside the house, avoiding the necessity of taking water inside. It is important that the trough be fixed in front of the house if it is put at the side or back draughts will occur in winter when the house is closed.

The interior fittings should consist only of nest boxes, dropping boards and perches, dry mash hoppers and a few broody coops. All these should be movable. Dry mash hoppers should be hung on the walls, at convenient heights according to the breed kept. If a bird has to crane its neck just a little in order to reach the mash it will not scoop it out on to the floor. Nest boxes should be either hung on the walls or stood on brackets, about two feet above floor level. If made with loose bottoms cleaning is very much easier.

Dropping boards should be about two feet above floor level and made with as few joints and gadgets as possible, an ordinary trestle table would be admirable. These should be thoroughly soaked with creosote, coal tar or other wood preservative, to prevent the droppings soaking in and causing a foul smell.

Perches are best made of 4 ins. by 2 ins. laths, free from cracks, the upper (2) sides rounded off, and should stand about six inches above the dropping board. Do not fasten them down to the dropping board, but let them stand on stout blocks, one at each end, a slot being made in the top of each block to take the perch and prevent it from turning over. This method will be much appreciated when the ticks come along, and they surely will.

Allow from seven inches of perch room per bird in the Mediterranean breeds, to ten inches per bird in Asiatics.

Allow fifteen inches of space between the perches.

This method of arranging the interior fittings leaves the whole of the floor space available for the birds to walk about in

Each house should be provided with two runs, which can be used alternately. The unused run does not lie idle, but is limed, dug up, and a crop taken off. This prevents the soil from getting foul and stale.

The space of the ground required can be calculated at the rate of 200 birds to the acre, or a run from 25 birds should measure about 25 yards by 25 yards, square runs require less outlay on fencing then any other shape. The fences for light breeds should not be less than 6 ft. high. For heavy breeds 4 feet to 5 feet is usually sufficient. The lower portion of the netting, say 18 inches to 2 feet high, is best of half-inch mesh but above that 2 to 3 inch mesh is quite serviceable.

DUST BATHS

In sandy runs the fowls will make their own, but in damp clay soils a bath should be provided. A shallow box about a foot deep placed underneath shelter and kept filled with road dust, fine sand, or wood ashes answers the purpose well. If the hens seem restless and picking at their feathers, add powdered sulphur and some dry tobacco dust to the contents of the box, to make more sure of killing the lice that are obviously worrying them. During the moult, keep the dust bath in mind.

BREEDING

If permanent success in poultry-keeping is desired, systematic breeding must be carried on. It is only by carefully breeding from the best birds that the great improvement in our domestic poultry has been attained.

The art of breeding, of course, is governed by a few rules which are simple and easy to understand; and these rules must be faithfully observed if any degree of success is to be gained:—

1. Select only the largest and best formed birds of the breed to breed from.

2. Never breed from weakly, sickly, stunted, mismarked or deformed birds.

3. Always select the best layers to breed from.

6. Coops for Chickens.

4. Never breed from cocks or hens under a year old, or more than three-and-a-half years old. The best chickens are produced from hens two years old mated with cocks two years old.

5. Never breed in—that is, the male bird should always be of a different family from the hens he is mated with, though of the same strain. Never breed from brother and sister.

6. To improve the breed, the hen must be mated with a cock that is superior to her. If the cock be inferior to the hen, the chickens will be inferior to their mother; but if the cock be superior to the hen, the chickens will be superior to their mother. An inferior cock will work ruin in a poultry-yard. It is much more economical to pay fifty rupees for a really good cock to mate with the breeding hens than to buy an ordinary bird for that purpose and pay ten rupees for him. The cock must not only be a good one, but must be from good stock and properly bred. If he is not from a good strain or family, he will not produce good chickens.

7. To breed successfully, proper food and careful management are absolutely necessary.

In selecting a cock for breeding purposes, it is necessary to see that he is of good size, young and active with broad chest and erect carriage. The hens should be true to the colour as type of their variety or breed of right weight. Birds should not be bred from if they are subject to any disease. Mate up your breeding pens as soon as the birds are adults; in the case of pullets and cockerels it is quite safe to mate cockerel as soon as his sickles and backles are fully grown. Pullets can be mated as soon as they got well into their stride in laying.

A vigorous cockerel can manage 15 hens, and should not be given less than seven or eight, in the light breeds. In the heavies 5 to 10 females per male according to the size of the breed, is about the correct number.

Not more than 3 to 4 hens should be given to a Brahma or Cochin stock; the Rock, Langshan, Orpington and Game Cock should have 5 to 6 hens; the Wyandotte and Rhode Island Red 6 to 8; but the Chittagong, Minorca and Leghorn need 7 to 10 hens for each cock.

Some males have a special—favourite in the breeding pen and pay too much attention to her, sometimes causing infertility, or soft-shelled eggs; this can generally be detected by the hen's plumage at the back of the neck and on the saddle being particularly bare. Eggs become fertile in from four to fifteen days after mating. One union by the male fertilises a whole batch of eggs, probably fifteen or more. If hens have been crossed by a male from a wrong pen and the male is of another variety the eggs should be used for table purpose only after three weeks have elapsed one can safely take it that the eggs are fertilised by the male belonging to the pen.

If eggs, on being set, are found to be infertile from any particular pen the cock is usually to blame; he may not be treading the hens properly, which can be discovered by observation, or he may be incapable of fertilising the eggs.

Poultry generally being to moult in July and August, and during July, August, September, and even October, the cock birds are not so active as they are from November to April. The excessive heat, during May and June is very trying and exhausting to some birds. The cocks and hens should be separated during the time of their moult, July to September, and also during the very hot season of the year.

Half the battle of rearing strong useful chicks lies with the parents, for the condition of the breeding stock, especially of the male bird, is of the utmost importance; the birds must all be fully grown and in the pink of health and condition, neither too fat nor too lean. The best results are obtained when the male bird is removed from the breeding pen at the end of the season and kept by himself and fed till he is wanted again. He should not be allowed, even during the breeding season to remain for any length of time in the pen with the hens without a change.

Size of egg is a point which is of great importance, and must always be borne in mind when breeding for eggs. It is most difficult to obtain, and maintain; the tendency is for eggs and stock to deteriorate in size as fecundity increase. The old advice "never set an egg that weighs less than two ounces" is not good enough. Better say never set an egg unless it weighs more than two ounces; and, what is more important still, the male bird in the breeding pen should have the large egg factor and have inherited it from his parents. A male bird which has not the large eggs factor will do a tremendous amount of damage to the flock, all his off-spring will lay smaller eggs than the female parents did, and it will take many years to breed the large egg factor back again. When testing a male for L2 do

ot neglect size of egg as well, both are bsolutely necessary, and the one is of ttle value without the other. It is size of gg which commands high prices in India nd elsewhere. One hundred and fifty rge eggs per bird per year is a better roposition than two hundred small ones.

Some pullets start off by laying very nall eggs, and after two or three months ley get up to the two ounce standard. he better pullets lay, for a start, a few ggs just under two ounces, and after a eek or two they get well above the two unce standard—these are the birds to eed from.

Feeding has a marked effect on size egg. There is a limit to the size of each dividual bird's egg, and that limit can ly be reached by correct feeding. nderfeeding or incorrect feeding reduces e size of eggs as well as numbers.

CROSS BREEDING.

Breeding cross-bred poultry needs skill, commonsense and knowledge of the characteristics of the different breeds. All crosses are not good. Cross-bred fowls should not be bred from; they should be used for the table and for laying only. If they are bred from, their progeny will be sure to deteriorate. The first-cross is the best. By first-cross, we mean the progeny of a cock of pure breed and a hen of another pure breed. If the first-cross hens are bred from, they must be mated to another pure bred cock of the same breed as their father. The cross-bred cockerels or cocks must never be used for breeding.

There is very little advantage to the poultry fancier in producing cross-breeds. The pure breeds are very much more satisfactory both as layers and table fowls, as well as for exhibition. Their eggs and

7. Rearing Chickens.

chickens demand a better price, and consequently pay better, while the egg-production can be more easily kept up to the standard.

As a cottage industry the breeding of cross-bred fowls can be advocated. The method is a cheaper one, and one that will have a more rapid effect on the poultry of this country. The aim being merely to provide eggs and fowls for human consumption, the pureness of the birds is not essential while they lay well, and grow to maturity rapidly.

GRADING.

Grading is the mating of pure-bred males to Desi hens, and the resultant progeny are called "grades". By this method we can improve the Desi hen by continuously mating her female off-spring back to a pure-bred males of the same variety as that with which we start.

8. Coops for Fattening Fouls.

In-breeding is the haphazard or indiscriminate mating of closely related stock. In-and-in-breeding is the mating of brother to sister. Line-breeding is the careful and discriminate mating of selected birds which are closely related; it is in-breeding carried out with scientific methods. Birds that are line-bred can be traced back to a pair or more of common ancestors, and they will contain the blood of these ancestors, and these only, in a greater or less degree.

There is a tremendous risk in line-breeding, as it tends to multiply and increase faults. It should not be attempted by anyone who has not had considerable experience, and who has not a natural ,'eye" for selection.

EGGS.

The egg is a mysterious little thing none can deny. Our readers will be amply benefitted on going through the nature and nutrition of eggs which make them highly popular. According to dieticians only eggs and milk are complete food. A pound of eggs has more food value than a pound of milk. Eggs have a very distinct place in human diet. Like milk, their protein content is high and like milk they contain most of the essentials for the growth and repair of body tissues. The white of egg is a solution of albumen a typical adequate protein mixed with a very small portion of other substances. The yolk is rich in phosphorous containing fat in emulsified form and is easily digested. It has also a protein with a high phosphorous content as in milk; and these mineral elements are particularly responsible for the nutritive value of this food Besides the minerals, the yolk also has an antirachitis vitamin factor, which operates in the assimilation of calcium and phosphorous and effects proper development of bones and teeth. In other words, the egg is essentially liquid meat, being one of the most easily digested and assimilated forms of animal food, and is one of the richest in growth-promoting vitamins.

USES OF EGGS.

Liquid eggs, yolk of albumen, are used for chemical preservative as boric acid.

Dried eggs are utilised for tanning.

Egg-yolk oil is used in dressing glove leather and book-binding.

Dried albumen is used for finishing glazed leather in chrome tanning and is also used as a mechanical fixing agent in textile dyeing.

Eggs have few other uses such as gilding books, in making printers' ink and in vetrifying wines.

COMPOSITION OF EGGS.

It is known to almost everybody that human beings cannot grow unless the food they eat contain five essential nutrients, namely: (1) Protein (the tissue building material), (2) Carbohydrates and fat (fuel), (3) Ash or mineral matter (body regulators and bone builders), (4) Water, (5) Vitamin.

Hen Egg:—Ash 10.68, Fat and carbohydrates 10.59, Protein 12.83, water 65.9, vitamin A.B.D.

Duck Egg:—Ash 13.7, fat and carbohydrates 12.5, Protein 12.1, water 60.8, vitamin A.B.D.

Besides the immense value as body builders the eggs are largely utilised for hatching purposes. In this case only sound, matured and fresh eggs should be selected otherwise no satisfactory results may be expected. And for this purpose the eggs must be tested for fertility previous to submitting them for hatching.

TESTING OF EGGS.

An expert tester can put an egg in his hand, and holding it up to the sun, say whether it is fertile or not. But for a novice this system of egg testing is very difficult and their purpose may be satisfactorily done with an egg tester, by which it is possible for them to distinguish fertile from infertile eggs. The following is a simple method of testing the fertility of eggs:—Take a piece of stout cardboard and cut a hole in it the shape of an egg, only a little smaller, place one of the eggs sideways against the hole, and then hold up to the light brought closer than 6 inches to it. If the egg is perfectly transparent like a newlaid egg, it is infertile; but if a small spot with fine veins around resembling a spider in web is seen floating about the centre of the egg, it contains a live embryo. If an egg contains a dark mass that moves to and fro, and the spider-like form is absent and the air-cell line misty, the egg may be removed as containing a dead germ. Any doubtful egg should be tested on the fourteenth day after setting. It is impossible to tell if an egg is fertile or not until the 10th day after setting. An egg that is quite clear after being 21 days under the hen is infertile; if the egg has a partly-formed chicken in it, or is rotten, then it is addled; if the chicken is fully formed in the egg and is dead in the shell, it is spoiled. If germ has formed in the egg and not hatched, it is fertile, but has been addled or spoiled by some cause or other for which the eggs may not be to blame.

9. A Pair of Leghorns.

We, however, prefer the following method of testing eggs: On the 19th or 20th day after setting fill a large bowl with warm water, the temperature of which must be exactly 102°F neither colder nor hotter and place the eggs in the water. After a minute the fertile eggs containing live chickens will wriggle in the water that is caused by the chickens endeavouring to make their escape from

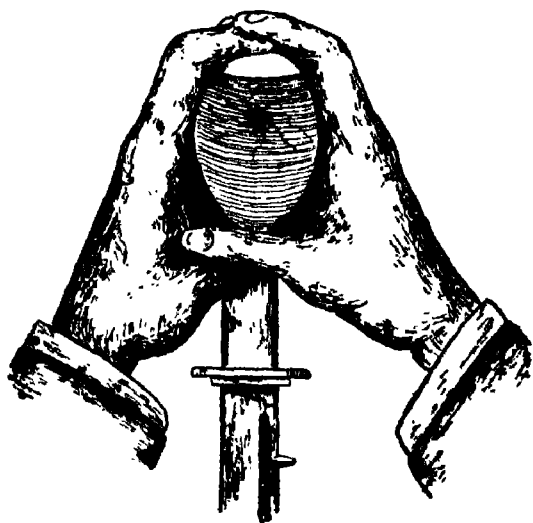
the shells. The infertile and addled eggs will float about, but will not wringle. The eggs must be allowed to remain only for 2 minutes in the water, and then taken out, properly dried.

EGGS FOR HATCHING.

Eggs for hatching should be stored on their sides, which is their natural position, covered in a layer of bran and turned daily until they are set. Wrapping each egg in grease-proof paper will greatly assist to preserve the moisture in the egg. Keep them as nearly as possible in a cool place.

PRESERVING EGGS.

There are several methods of preserving eggs, a few practical methods of which follow:—

Buttering.—Smaller poultrykeepers who retain the eggs for a few weeks for home consumption, find it enough to butter them—that is, rub a small quantity of fresh butter over the shell, and store in ware jars or pots in a cool place. Glycerine or any sweet fat may be used for the purpose. The shell must be coated and pores filled.

10. Testing An Egg by Candle Light.

Lime Water.—The oldest know method, and that which is most gener in Europe, is by saturation of eggs in lim water. It is the process which is the leas expensive. Although the shells ar hardened by lime deposited upon them that is an advantage in that on remova from the tanks the contents do not deteri orate rapidly, and, further, these egg are easily distinguished as "pickled", a they are called. The solution is forme by mixing freshly slaked lime with wate —say, one or two pounds of lime to fiv gallons of water, stirring the mixture tw or three times per diem, until the whol forms a milky fluid, when a pound of sal is added to the above quantity. Afte allowing it to stand a few hours to settl and clear, the liquid is poured into th vats or tanks or tubs, which are the ready for the eggs.

Water Glass.—The system which i most generally adopted for smaller ope rations is by the use of what is popularl known as "Water Glass", which is solution of silicate of soda, discovered b a German chemist. The results are quit equal to lime water, without thickening o roughing the shells to the same extent The eggs come out of the fluid clean an fresh-looking. The solution is generall sold of full strength, and a five per cent mixture is found sufficient, namely, 5 pe cent. of water glass to 95 per cent. c water. The latter should be pure, an preferably boiled, mixed when hot, bu allowed to become quite cold before use A stronger solution than that name affects the flavour of the eggs. Thi method is more expensive than lime water

Cold Storage.—In America thi system is almost universal. It is in th hands of great firms and companies wh have erected huge plants wherein the egg are stored in cases. The most satisfactor temperature at which to keep the egg i 29° to 30°F. It is necessary to arrang

for a constant supply of pure, fairly dry air. When removed the general practice is to move from one room to another, each slightly warmer than the other.

HATCHING.

Reproduction involves the production of eggs containing the living germ and the materials requisite for embroyonic development. When an egg has been laid there must follow the more or less mechanical process known as incubation, together with suitable environment, as a result of which the germ enlarges into the embryo, forming stage by stage, the various parts and ultimately the complete chicken, to the point when it emerges from the shell.

These factors can be supplied to eggs for hatching by two ways, i.e., by natural and artificial means. Practically speaking there is no difference between the two as far as hatching is concerned. In spite of the advantages of artificial hatching a growing tendency has been manifested of late by reversion to natural hatching for the reason that results are generally more satisfactory.

The vital period of an egg undergoing incubation is undoubtedly from the third to the ninth day and a plan that is worth attention is for the eggs to be set under hens for the first ten days and then transferred to the incubator to be finished off. Thus during the 21 days a hen can be entrusted with two lots of eggs and take a full batch of chickens, when hatched, direct from the incubator.

PERIOD OF INCUBATION.

Hens usually begin to lay in February or March and continue laying, with a few intermissions, until July or August, when they go into moult. The hens usually begin to moult in July or August, and get through it in September or October. During this time they should be separated and not forced to lay. Some hens lay during October to January, but not many will do so. By careful breeding fowls can be got to lay in this period. Pullets generally begin to lay when they are from 6 to 9 months old. Birds hatched in December to March will begin to lay in October or November. Pullets hatched in April, May and June will begin to lay in January to March. Those hatched in July and August will lay in March and April.

11. Hearson's Egg Tester.

Chicks hatched in January to April will be ready for market in the cold season.

NATURAL INCUBATION.

In adopting natural incubation only hens that are distinctly broody should be allowed to sit on eggs. Now when a hen desires to sit a fever comes over her and her blood becomes heated. This is known as broodiness. Thin, unhealthy, diseased hens should not be allowed to sit.

Suitable nests must be provided either on the ground or in wooden boxes and placed in a quiet corner, where she will not be disturbed. The nests should be free from the attack of rats and insects. The broody hens must be properly looked after and the most successful amongst them amply cared for.

The eggs to be hatched must be at first tested for fertility. They must

possess a firm shell because soft shelled eggs are easily crushed when coming in contact with other eggs. The eggs are then arranged in the nest and the hen is gently placed on them and left alone. But before puttig the hen, she must be placed under a basket and fed and watered. When the habit of the selected stock is not known, it is a good plan to set the hen on half a dozen common eggs, and allow her to sit and settle down for a couple of days, after which common eggs are replaced by good ones. This will, no doubt, ensure the safety of good eggs.

FEEDING THE HENS.

Under the condition named it is necessary to make arrangements for feeding the hens, and giving them an opportunity of dusting themselves to cleans their skin and plumage. For that purpose fine dry earth should be separaeely provided. If there are only two or three hens they may be allowed to come off when they desire to do so, in which case food, fresh water and a dust bath must be available. With a largest number of hens it is found necessary to let them off in rotation, as otherwise there is considerable risk of quarrelling, and may be interference with each other's eggs.

Where birds are lifted from the nest they must be carefully handled, as they usually tuck the eggs under their wings, especially when disturbed. Should a hen be lifted bodily, the chances are in favour of an egg droppipng and breaking itself and others. She should, therefore, be lifted by the wings, taking care to see that the eggs remain in the nest. Nests should be examined every day. Sometimes an egg is accidentally broken, the contents adhering to her breast and on the remaining shells. Under these circumstances, or in case she fouls the nest, she should be washed and also the eggs, remaking the nest. Hens should not be disturbed more than is necessary.

The hens should be fed with wheat paddy or maize and plenty of water but no soft food. This is the only food necessary whilst she is setting. After feeding the hens should be allowed to take dust bath to rid herself off the vermin that may be troubling her. Unless a dust bath is provided the hen will get covered with vermin. After this gently drive her into the box and close the door. Do not allow her to remain outside for more than 20 or 30 minutes in the hot weather and 10 or 15 minutes in the cold. If she makes the eggs and nest dirty, the nesting material is removed and replaced by fresh one and at the same time the eggs are washed with warm water. This treatment is continued during the whole period of of hatching, which varies somewhat but generally occupies three weeks.

ARTIFICIAL INCUBATION.

Having discussed the natural method of hatching chickens we will now proceed to describe the artificial methods. There are two types of incubators, the hot water and the hot air. In the former type the eggs are heated by radiation from a tank of hot water; in the latter type the eggs are heated by a continual flow of heated fresh air.

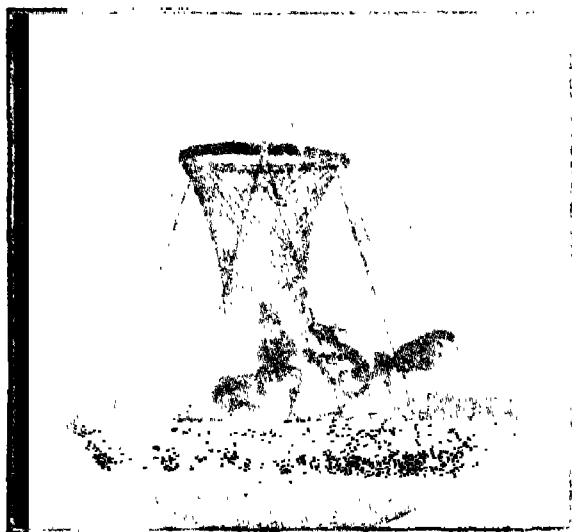
Incubators, of either type, should be placed in a room in which the temperature varies as little as possible. As the temperature of weather generally varies during 24 hours of a day, the incubator should be so adjusted that the temperature in the egg drawer will vary scarcely one degree under these conditions.

As regards the working of an incubator follow the instruction contained in the maker's handbook, which is always supplied with the machine. Let us now give brief description of hot water type only, as it is largely used in this country with success.

The hot water type or tank incubator is invented by Charles Hearson. The

machine is now a days named after him. It is excellently designed and carefully made, with a delicate regulator and is reliable which is shown in the diagram. The regulator consists of a small metal capsule, formed of two pieces of thin brass, hermetically sealed at the edges. Inside are about twenty drops of a liquid, said to consist of ether and alcohol, which boils at the temperature required to be maintained (104°F.). So long as the capsule is not subjected to the heat required to expand the liquid, the sheets of brass remain flat. When the heat is increased these distend. The power thus generated is used to work a lever, connected with a rod at the end of which is suspended a metal cap otherwise resting on the chimney at one side. The heated air from the lamp, instead of entering into a tube fixed in the tank and surrounded by water, as the cap is raised, passes into the outer air, and the temperature in the tank and egg chamber gradually decreases. This arrangement thus maintains the heat almost without any change. We have known it keep an incubator to within half a degree for weeks, in spite of varying weather. The eggs are laid upon a concave tray, usually covered with coarse canvas, formed of perforated zinc, below which is a water tray. Fresh air can only enter from below, and, having to pass through canvas saturated with water, any lack of moisture is thus supplied. All that is required is to see that the air is not very cold as it enters, otherwise it would fail to absorb sufficient moisture. That is achieved by maintaining the room temperature at 55 to 60 degs. F.

Having describing the machine we now proceed to give a brief description of its working.

In starting a machine it is advisable to run it empty for a few days at 101°F.

12. Feeding Chicks Green Food.

When it is steady at that temperature the eggs are introduced. Having fitted up the capsule and lever-rod by means of the screw-head at the top, the temperature is regulated by moving the small weight along the lever arm. Once the damper placed loosely over the lamp flue at 101 degrees, screw down the weight on the lever arm. After a little time the the eggs will begin to get warm, and the necessary 103°F will be registered by the thermometer in the egg-chamber. Be very careful not to run the machine at too high a temperature at the start, for this is a critical time, and the germs will perish if the heat is too much. The bulb of the thermometer should be placed a little above the eggs, and not directly in contact with them, else a false degree of heat will be registered.

After the eggs have been incubating for 36 hours or so turning of eggs commences. The eggs are turned and cooled up to the 18th. day, when they should not be touched. Good results are obtained by turning the eggs twice a day whereby they will get sufficient cooling. Never take the egg-drawer right out when

attending to the eggs, or the machine will cool down and warm may accrue. To turn the eggs take the centre of the drawer gently down. Next replace the eggs that were in the centre on the outside. Then take out the row nearest the centre on the other side and roll those eggs down afterwards putting the eggs previously removed on the outside. For the facility of this operation it is better to mark the eggs with a cross on one side and a circle on the other. Turning is essential to prevent the contents of the eggs from sticking to the shells. The period of turning and cooling will however depend upon outside elements and the length of time the eggs have been incubated. Start with five minutes or so, and then be guided by the touch of the eggs. So long as they feel warm all will be well. An incubator chart should be hung up on the wall over each machine for writing on it the date the eggs were set together with the number and breed, etc. These charts should be kept for references. When the chicks hatch, they are to remain with a hen or transferred to the drying box.

REARING OF CHICKENS.

A very great deal depends upon the way chickens are treated during their growing stage. A large percentage of chickens die from sheer neglect or mismanagement. Chickens of all breeds cannot be treated alike or kept in the same coop. The reason why each breed of chickens needs to be kept separate is because some breeds grow faster and develop quicker than others, and some are more active and quarrelsome than others, and each breed needs different treatment.

Nature has provided the newly hatched chicks with ample nutriment for at least 24 hours. It suffers little deprivation from 36 hours abstinence, and for it to partake of food within less than 12 to 18 hours after a healthy hatch, is rather prejudicial than of any benefit; but it is not advisable to leave them longer than 30 hours without it. After the chickens are hatched for 30 hours, they must be taken out of the old nest, and, with the mother, placed in a lean box, in a warm, dry and quiet corner. The mother must be fed with good grain wheat apart from the chickens and then she must be allowed a good drink of water and put with her chickens in the box. Care must be taken that chickens do not swallow the grain given to the hen; if they do so it will stick to their throats.

In feeding chickens the best food for the first three days is stale bread-crumbs moistened with milk and oatmeal and finely broken rice given alternately every two hours. The food should be scattered on a clean board upon which the chickens are placed. A very small quantity only should be given at a time. A handful of coarse sand or finely-sifted grit must be scattered on the board on which the chickens are fed. After the third day they are fed six to eight times a day and their morning meal should consist of equal parts of finely ground oat-meal, barley meal, pea meal, and whole wheat-flour sufficiently moistened with milk so that it will not stick to their throats. The other meals should consist of coarse ground oatmeal and ground wheat and broken rice given dry. A little finely-chopped onion and garlic should be given twice a week. Oil-cake is very good for growing chickens but it may be given only a small quantity after the chickens are more than three months old. Green food is very nutritious for the growth of chickens. Young tender mustard, cress or lettuce or tender grass is the best for young chickens.

According to Isa Tweed the following makes a splendid mixture of soft food very suitable for the chickens:—

Whole wheat-meal	2	pounds.
Finely ground barley	1	pound.
Finely ground gram or peas	2	pounds.
Finely ground rice	3	,,
Wheat-bran	3	,,
Linseed-meal	1	pound.
Precipitated phosphate of lime	½	,,

Chickens must not be allowed water for the first three days when they are fed on eggs. If egg is not given, water may be allowed on the second day. On the fourth day, and in subsequent days water must be given regularly after each meal.

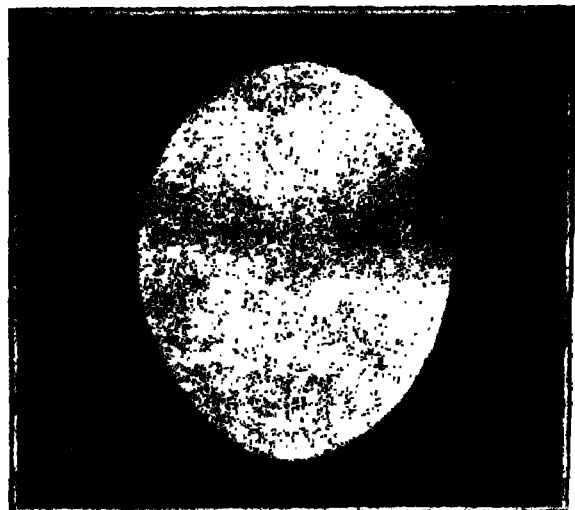
In rearing chickens care should be taken that before they are old enough to digest the food, large quantity of food may not be given at a time as a very large number of chickens are killed by injudicious and excessive feeding. Hence the proper way is to feed every two hours or so and give only small quantities that can be eaten up at once.

When the chickens are hatched by artificial means they must be removed from the egg drawer and transferred to drying box and kept there for at least 16 hours, when they are removed to the foster-mother; which is one of the best contrivances to take the place of the mother hen. Care must be taken that the drying box and foster mother are not too warm, and that there is sufficient ventilation. The heat must not be more than 90°F. No water must be kept in the machine, and there must be free circulation of air through the machine. If the foster-mother is allowed to become too close and warm, the chickens will become ill and die.

Another method of rearing chickens which s simpler and cheaper is to allow them to remain with a hen to the drying box for three or four days. Then they are taken out and fed and placed in the box of foster-mother. The next morning they are picked up and put on a clean plank in a large open box; some food is thrown from a little above their heads down on the plank. As soon as the little creatures stop picking and running about, they are put back into their box and kept quiet for two hours, when they must be taken out and fed again. This process is repeated until they are sufficiently strong, when they should be fed in a manner as indicated above.

FATTENING AND CAPONISING.

When fowls are wanted for fattening up for table purposes, they should be taken in robust condition, and then treated as described below:—

The first main thing required for fattening fowls some sort of wooden boxes, called coops, are employed. They should not be too large, say, about eighteen inches from back to front, fiteen inches wide, and twenty-one inches high. A curtain may be used to cover the coop, or row of coops, when the fowls enclosed are not feeding, but it is best to have the coops in a nearly dark room, in which the fowls will be most contented. The

13. Infertile Egg.

back of the coops slide open to admit the birds, and a drawer may be seen at the back: this is well covered with sand to receive the droppings, as it is very necessary to keep the coop as clean as it can be. Before puttting a bird in the coop it should be well wiped, both inside and out, with a rag saturated in kerosine oil, to keep vermin from attacking the birds, which would prevent their having rest and thus retard their getting into the fat condition necessary. Over the drawer and flush with the floor of the coop there should be some thin wires drawn to prevent the fowls from stepping into the drawer, but these wires should not be so thick, or so closely set, as to prevent the offal from falling into the box. Such a coop can be very easily constructed by any ordinary carpenter, at a small cost.

Though the dimensions of the coop have been given, it is not necessary that they should be strictly adhered to, as for a small fowl a smaller coop should be made, the object being, not to give too much room, and prevent the bird from turning round. In such a coop, a fowl should fatten within two to three weeks with proper food.

Rice (not paddy), barley meal or, best of all, Indian corn coarsely ground, boiled in milk, or if that cannot be spared, though it is the best, butter-milk will do. One day feed your fowls on rice boiled in butter-milk or milk, the next on Indian corn boiled in milk or butter-milk, and so on; or, better, change the variety of food once a day, always giving as much as the fowl can eat; and this should be supplied three or four times a day regularly. The feeding trough in front of the coop should be washed out twice a day at least, or, best, when replenished with food each time. After some time it will be observed that the bird or birds in their coops seem to be moulting; if such be the case, and they are not then killed, they will grow thin again; to obviate this, give them half a wine-glass of molasses one day with their food, at this period of their fattening, and proceed again as described. The food should not be boiled into a paste, and may be mixed with advantage with chopped fat, lard, or drippings of roast meat, or gravy.

CAPONISING.

Caponising is the taking away from cockerels the power of reproduction. It is practised in this country to considerable extent to increase the size and weight of the bird and tenderness of the flesh. The operation should be performed in the cold weather, and when the bird is between four and six months old.

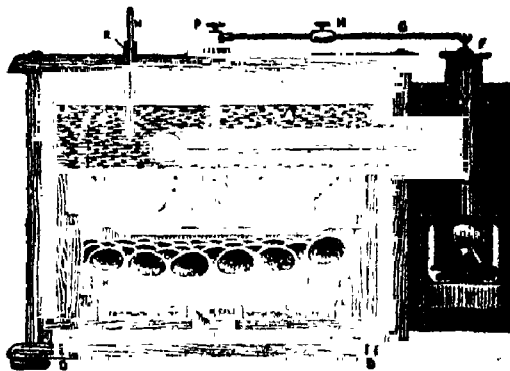
The extract from "Indian Amateur Poultry Book" by "Landolicus" clearly shows the ways of doing this operation with success:

Though easy enough in practice when experience has been gained, it is not quite so easy to describe on paper. A very sharp, small surgeon's knife, with a curved point, is the best thing to use; as also a curved surgical needle and some waxed thread should be at hand.

Two persons are necessary to perform the operation, one to hold the bird on its front, back uppermost, on the operator's knee horizontally, while the latter is seated on a chair. The bird is held firmly, with its right leg and thigh along its body doubled up as it were, exposing the left flank or side along which its left leg is held stretched out towards its tail. It is on this (the left side) the incision must be made carefully, after removing the feathers, just behind the last rib. The skin will first be carefully and well raised with the point of the needle at this spot (just behind the left rib), so that in making the incision the bowels are not injured in the slightest degree. Then

make the cut into the cavity of the body close to the needle, with a sharp clean cut, large enough to admit the finger. If any of the bowels protrude, return them. Insert the forefinger and direct it to the backbone, somewhat to the left side of the spine, and the finger will come in contact with the left testicle, which is in form about the size of a horse-bean; it is liable to slip though attached to the spine, but it must be gently taken away from its attachment and removed through the incision. Sometimes it will slip after being detached, and be lost among the intestines; in which case it may remain in the body of the bird without much inconvenience to it, yet it is liable to cause inflammation. Having, let it be supposed, dealt with the left testicle, the right one must be found, which is easier, as it is directly to the right of the one removed, and it is treated just as the former was, that is to say, is drawn away gently and removed.

The lips of the wound are drawn together and two or three separate stitches are made with the needle and waxed thread; when sewing; do not injure the intestines: no continuous sewing as it were, must be made:—in other words, each stitch must be made separately and knotted distinctly, and not in conjunction with the last made.

The operation being concluded, the bird should be put in a coop, and some water and soft food given him, such as milk and bread, after which he can be turned out in some quiet spot in a few hours, care being taken that other birds do not molest him, or his life might be endangered by the wound not healing. It is best, too, to catch him gently, and without chasing him, for three or four days, placing him in a coop with some clean straw on the floor of it, the coop being put on the ground, for should he have to fly up to his perch, or fly from the coop to the ground, it would injure him. After four days he may be set at liberty among the other poultry, and can be placed to fatten when he has quite recovered from the effects of the operation.

14. Hearson Tank Incubator.

A, Tank; B, Moveable Egg Tray; C, Water Tray; D, Inlet of Air; E, Ventilating Hobs; F, Damper; G, Lever; H, Lead Weight; K, Slips of Wood; L, Lamp Chimney; M, Non-conducting Material; N, Tank Thermometer; O, Needle; P, Head Screw; R, Filling Tube; S, Capsule; T, Lamp; V, Chimney.

FEEDING OF POULTRY.

The question of feeding poultry is of paramount importance. Three aspects of the subject naturally present themselves namely, the effect of food upon the health of the stock, the quality and quantity of the produce, and the cost of production.

Feeding bears directly upon the health of the stock. A point that has not been considered to any great extent, however, is the cumulative effect of any given system of feeding upon the reproductive capacity of the birds, whereupon depends the vigour and stamina of future generations. Much of the trouble as regards infertility, bad hatchability, and the heavy rate of mortality among chicks during the first six weeks, is due to defficiencies in the food supplied to the stock.

All foods are composed of various groups of compounds. From the chemist's point of view these may be classified as nitrogenous matter of proteins, carbohydrates, fats, fibre, ash or mineral

matter and vitamins and sometimes skimmed milk and codliver oils.

The art of feeding lies in mixing the available foodstuffs so that the various constituents are all in their proportions also taking into account the quality and cost of the grains and various meals, the degree of concentration or bulk of the mash and the condition of the fowls.

A few formulas of balanced ration for the poultry as given in "Poultry Farming In The East" by Mrs. A. K. Fawkes are given below:—

I.	II.
2 parts bran	3 parts bran.
3 parts Ata. (wheat meal).	3 parts Ata.
2 parts maizemeal	1 part maizemeal.
1½ parts fishmeal	1 part gram meal.
	1 part fishmeal.
Nutritive ratio 1:5½	Nutritive ration 1:5.

III.	IV.
3 parts bran.	3 parts bran.
4 parts Ata.	2 parts Juar meal.
1 part Juar meal.	2 parts Bajra meal.
1 part Bajra meal.	2 parts gram meal.
1 part gram meal.	2 parts fishmeal.
1 part fishmeal.	
Nutritive ratio 1: 5½.	Nutritive ratio 1:5¼.

It will be noticed that the animal protein in each recipe is supplied by fishmeal. If fishmeal is not obtainable meat (lean), or meat offal must be substituted. Meat must of course be given fresh each day; if the dry mash system is adopted it must be given separately, at the rate of about one pound per fifty birds per day.

In cases when birds are not on free range where they can always obtain green food in plenty, or when green food is not available, there is a lack of mineral salts, chiefly calcium, in their food and the ration is not balanced. In order to supply mineral salts in such cases, make a mixture composed of 3 lbs. bonemeal, 1 lb. limestone dust, 1 lb. common salt, and add five ounces of this to every ten pounds of mash. A more elaborate mixture is as follows:—

Bone flour	50 lbs.
Limestone dust	22 „
Salt	10 „
Sulphur	5 „
Oxide of iron	2 „
Potassium iodate	3 oz.

Add three or four pounds per hundred of mash.

During the breeding season it is a good practice to feed this mixture to the breeders, whether on free range or not.

DRY AND WET MASH

When mash is fed in the dry form without the addition of water or any liquid, it is known as the dry mash system of feeding. It is the simplest, safest and most labour-saving method; a supply sufficient for a week or two can be placed in the pen, and no further labour beyond opening and shutting the hoppers is necessary; it is a little more expensive in original cost of utensils, properly constructed hoppers being essential, but this is more than rapid in the saving of labour. A good dry mash hopper is so constructed that as the birds consume the mash more drops down into the trough does not clog, and does not allow the birds to scratch or scoop the food out on the ground and cause serious waste; a hopper always works best when fowls have to crane their necks to get at the food, and this is obtained by fixing the hoppers at just the right height above the level of the birds as they stand when feeding. With the dry mash system the timid bird gets as much food as it requires it can always find plenty of opportunities for a quiet feed, without being bullied and chivvied about as is the case with wet mash feeding. There is no risk of over-feeding and indigestion with the dry system.

bird eats because it wants to, and it has all day in which to do it, it does not have to gobble up its day's supply as fast as it can before the others seiqe it. Dry mash encourages the flow of digestive juices, thus aiding digestion. It is particularly suitable to birds kept in confinement to a greater or less degree, it is something to occupy them all day long. Birds cannot eat a lot of dry mash without having a drink; exercise can in this way be encouraged by putting the water troughs at a distance from the hoppers, this giving them a walk each time they want a drink.

It is usual to keep the hoppers open all day when birds are in full lay and in good condition; if they are becoming too fat, or are out of lay, the hoppers can remain closed for part of the day, or the mash made bulky by the addition of extra bran.

Wet mash is more palatable to fowls, and they eat it voraciously because it is tasty. Inexperienced poultry farmers frequently make mistake in mixing the required quantity of the rest mash for this reason the fowls are occasionally subject to various sorts of bowel complaints.

Wet mash is generally made by moistening one or some of the constituents, usually the bran, and drying off with the meals. Water, or the liquor that is poured off after cooking meat or vegetables, is used for moistening; some even go so far as to cook the foods. Whatever process is favoured, the main point is to see that the mixture is not too wet; it should be of a crumbly consistency, should bind loosely when made into a ball with the hands, and when dropped on the ground it should break up easily.

Wet mash incurs a great amount of daily labour involved in weighing, mixing, and serving it out in the troughs, and the very frequent scalding of the troughs for cleanliness; it requires more skill and judgment on the part of the poultry man; if insufficient is mixed the birds are underfed, if too much is given they are either overfed or the food is wasted as it will turn musty and sour and must be thrown away, as it cannot be kept over until the following day.

15. A Pair of Rouen Ducks.

Two ounces (before moisture is added) per bird is a rough guide to go on when measuring out the mash, but a bird out of lay will not require as much as this, whereas a bird in full lay may consume half as much again; in any case, they should never be given more than they will eat up readily in from fifteen to twenty minutes.

CHARCOAL AND GRIT

Charcoal is given as a corrective of acids and gases in the stomach, and it also controls diarrhoea. It is supplied in powder form. Grit is given to supply carbonate of lime, its omission is likely to cause shell-less eggs or even to hinder laying; it is also said to assist the gizzard in the pounding up of food, but we are inclined to believe that its supply of lime is the more important. Limestone grit, oyster shell and other kinds of shells are the usual forms of supply. They must of course be broken down to a suitable size. Charcoal and grit should always be at hand, it is best given in small troughs or hoppers specially provided for the purpose.

FEEDING ROUTINE

To ensure good progress in poultry keeper should follow the feeding routine as described below:—

In the early morning give a scratch feed of grain such as paddy, wheat, maize, barley, etc. one handful to every four or five birds. The object of this feed is to give the fowls exercise and encourage the appetite. At about 10 O'Clock give the birds chopped green vegetables such as grass, green leaves, cabbage, spinach, lettuce, lucerne, etc. as may be available. Green food must be young and tender. Do not feed green food in the rainy days. If green food is hung up in a string just above the level of the bird's heads it will reduce wastage and provide some exercise. Between 11 A.M. and 3 P.M. feed the birds for the third time in the day. This time it is good to give the wet mash. After this just before the dark at the time of putting birds in the poultry room give a handful of grains per bird, which is sufficient for them to keep their appetite.

For the benefit of new poultry keepers we are reproducing hefe a few useful mashes from "Poultry Breeding & Production" by E. Brown, Vol. II.

GRAIN

Equal parts of wheat and kibbled maize

MASH

	parts by weight.
Middlings	6
Bran	2
Maize meal	4
Ground oats	2
Fish meal	2

From the same source two other layers' mashes and grain mixtures may be taken, these being as follows:—

GRAIN

	parts by weight.	
Wheat	3	
Kibbled maize	1	part.
Oats	1	..

MASH

Middlings	42	lbs
Potatoes or Rice (cooked)	28	..
Malt culms and	7	..
Bran	7	..
Fish meal or meat and bone meal	14	

GRAIN

As above

MASH

Middlings	42	lbs
Maize flakes or Biscuit meal	21	..
Bran	14	..
Soyabean meal	10½	..
Fish meal	10½	..

A mash formula which employs dried milk as the sole course of animal food and one which has given excellent results can be compounded as follows:—

MASH

Middlings	4½	lbs
Bran	2	..
Ground oats	1	lb
Maize meal	1	..
Dried yeast	½	..
Soyabean meal	½	..
Dried milk	½	..

GRAIN

Corn, or milo	116	lbs.
Wheat or kafir	116	..
Barley or oats	116	..

MASH

Corn or milo (Ground together)	80	lbs.
Wheat or kafir (Ground together)	80	..

Barley or oats (Ground together)	80	lbs.
Fish or meat meal	15	..
Soyabean meal (or pea-nut meal)	75	..
Mineral mixture	17	..
Finely ground salt	$1\frac{3}{4}$	lb.

Vitamin A supplement and calcium in any form—preferably as Corrie's mixture, should be provided separately.

GRAIN

	part by weight.
Wheat or dari	1
Barley	1

MASH

	parts by weight.
Maize meal	3
Bean meal	1
Barley meal	3
Bran	2
Clover meal	1
Meat meal	$\frac{3}{5}$

Vitamin A supplement and minerals should be provided separately.

FEEDING BREEDING STOCK

It is not advisable to allow the breeding birds to lay so heavily as the layers, since this tends to increase infertility, bad hatching and mortality in the chicks. It is necessary, therefore, to decrease the proportion of protein in the food. This can be accomplished by cutting down the animal food by one-quarter and at the same time supplying vitamin A and Vitamin D supplements together with Corrie's mineral mixture.

As an example of an eminently satisfactory breeders' ration that suggested by Newman (20) may be cited. This is as follows:—

GRAIN

	parts by weight.
Wheat	3
Oats	1

16. Khaki Ducks.

MASH

	parts by weight.
Middlings	8
Maize meal or maize germ	2

GRAIN

	part by weight.
Maize	1

MASH

	parts by weight.
Sussex ground oats or	2
Biscuit meal bran	1
Alfalfa or clover	1
Fish meal	2

Vitamin A and vitamin D supplements (greens and cod liver oil), and minerals should be added.

BABY CHICKS

First 48 to 60 hours nothing but water and clean sand.

First week, hard boiled eggs and bread crumbs. Small amounts of broken grain.

Up to 8 weeks of age	
1 part broken wheat	In covered hoppers always available.
1 ,, ,, rice	
1 ,, ,, ragi	
1 ,, ,, cumbu	

½ oz. meat offal per chick.
Growing mash in open hoppers.

GROWING RATIONS

Gradually increase size of grains.
Laying mash as per mash 1, but with

double the quantity of fishmeal and bone guano added. This is always before the birds.

DUCKS

Modern developments of poultry have greatly extended duck breeding, so it is necessary to discuss a few aspects of this industry in this article. Ducks have always proved themselves to be good layers. The breeds and varieties differ greatly in size, shape, and colour of plumage. The best breeds for meat are the Rouen, Aylesbury, Pekin and Muscovy. As layers the runner, Khaki campbell, Buff orpingto, and Magpie are well-known.

CONDITION FOR SUCCESS

The duck is a more hardy creature than the fowl, and as it takes to our hot climate better, it can be reared successfully with little care. The only necessary for its keeping is a running stream or tank. If there be grass around the water so much the better though it is not essential but trees or bushes for shade are absolutely heads; good broad shoulders, legs will be sufficient for 400 to 500 ducks.

BREEDING

In successfully breeding young ducks should be selected in early autumn. They must possess sharp bright eyes, projecting away from their heads. They should have then sleek necks and clean cut, not coarse heads; goods broad shoulders, legs will apart and plenty of space when laying.

Ducks can be kept together with drakes if flocks for market are being raised as drakes do not quarrel to the same extent as cocks. Breeding ducks must be kept in small pens with one male to four females at first, latter inreasing to six. Drakes can be left with ducks when the breeding season is over, because they will not injure the ducks.

FEEDING DUCKS

The method of feeding adult ducks will depend upon whether they have free range or not. Ducks that have free range will naturally find a good deal of their food, as well those that swim in rivers or streams. If they have such range or are kept for egg production, they should be kept in a racy and fit condition and slightly on the hungry side to make them forage for part of their food. Prevent the ducks from gorging themselves with acorns, as the latter will discolour the contents of the egg, making the yolk greenish, which turns black when the egg is boiled. Foods that ill-flavour the contents of the eggs must not be given in excess if the eggs are required for market purposes. Onions, fish or fish-meal, must be given in reasonable proportions. Breeding stock must not be over-fed. For general purposes two meals a day may be given. In the morning give a soft mash composed of barley meal, bread, middlings, and housescraps, with a little fish-meal (about 10 per cent.) several times a week. At night give a grain feed of oats and wheat, with maize added occasionally in the winter. Feed the soft mash in troughs and scatter the evening grain in a pan of water. The grain can occasionally be boiled as a change. For confined ducks green food is essential, but it should always be fresh. Plenty of drinking water and grit is essential, the grit being added to both drinking water and soft food. Observe utter cleanliness in both housing and feeding. Where the floor of the house is made of cement it can be regularly swilled and scrubbed down.

To fatten ducks increase the grain feed and reduce the green food and bran.

MASH FOR LAYING DUCKS

Wheat flour	2	parts by weight.
Bran	2	,, ,,
Rice or barley meal	½	part ,,

Maize meal	2 parts	weight
Fish meal	1 part	„

WET MASH FOR DUCKLINGS

Wheat bran	4	cups by	measure.
Wheat flour	1½	„	„
Maize flour	1½	„	„

First moisten the bran with cold water then add the wheat ata and then maize. Do not mix too wet or dry and feed by throwing small pieces in clean places for ducks to eat. Divide the day into 5 periods, feeding as much as they can consume in 10 minutes or so. At 3 weeks old the ducklings will eat from troughs. Add fishmeal up to 10 per cent. of the total weight after a week or two. You can also feed at this time on 1 part bran, 2 parts coarse sifted ata, 3 parts maize, pea or barley meal, 10 per cent. meat, and 5 per cent. grit or coarse sand, and green food to half what they have had previously. This mash is moistened with milk for best results, and abundance of water given to drink at feeding time. The ducks are marked at 8 to 10 weeks of age. Charcoal should be generously given in the mash.

HATCHING

Duck eggs require a little different treatment to get the best results; they can be hatched with others, but the average is not so good as when separate. It is generally agreed a little lower temperature is better; but the difference depends upon the machine. When employing Hearson's incubator it is advisable to regulate the temperature two degrees lower than that employed for hatching fowl's eggs. With American hot-air machines half a degree to one degree less is more usual. When free ventilation and free moisture are used, a little more moisture during the last few days, not before, is also generally better for duck eggs. Many large operators also think more airing or cooling advisable, but taking care to close the drawers whilst the trays are out, in order that they may heat up again as quickly as possible.

MANAGEMENTS

The ducks are nervous creatures, so do not startle them, as they are frightened of bright lights, shadows, and often die of fright.

17. Geese.

In any case they stop laying and go into a moult if they are suddenly moved to a new surroundings. To get good results it is better to make friends with young ducks.

GEESE

Geese like ducks require lots of bulky mash and grass is their appetising food. Goslings can be fed like ducklings and on the second day placed where they can have free access to a plot of tender grass, or else add extra green food to the mash. They can be fattened like the ducklings at 6 or 7 weeks of age, among ducks.

The only ailments among ducks worth noting are cramp and staggers. Their treatment and medicines are given later under poultry diseases.

TURKEYS

Breeding and rearing of turkeys is not an easy matter and great losses are sustained in most cases. These gene-

rally happen from immatured parent stock and also from feeding wrong foods to poults, which being very tiny can eat very small quantities at a time. The liast overfeeding causes indigestion. and often death. Turkeys are also susceptible to liver troubles caused by indigestion, cold and climatic changes. It is not advisable to raise turkeys without securing ample free range. Grazing and fresh green food is indispensible for success. The following brief description from "Poultry Farming In The East" by Mrs. A. K. Fawkes will be helpful to the farmers who intend to raise these animals with profits.

The poults are first fed bread crumbs moistened with milk, this being changed gradually to the same mash as suggested for chicks, except that chopped onion tops, lettuce, dandelion, chick weed, papita leaves or any other succulent green food, must accompany every meal and a dish of sour milk or milk curd placed where they can help themselves. Feed just what they will pick up quickly, then remove and leave no stale food lying about.

Do not feed chicks and poults together, except possibly just at first to teach them how to feed.

Give the young stock full range as early as possible and keep a gun handy to keep away crows and hawks. Give warm, dry, open-fronted housing. Feed, as they grow up, on a light mash once a day with onions and green food in it, and grain scattered at night. Avoid over-fat breeding stock and see that the turkey cock is not too weighty for the hens. He does not need to be constantly with the hens unless the flock is a very large one, say ten to twelve or more hens.

One fertilisation will be enough for the turkey hen's batch of eggs. She will usually lay about 18 eggs in a clutch, three times during the spring. Some breeds lay also in the autumn. Turkey hens make good mothers, but hens or incubators are more easily arranged for. Norfolk turkeys and the American Mammoth Bronze are the best known varieties.

POULTRY HYGIENE

Cleanliness is essential to the health of fowls. A proper system of periodical cleaning and disinfecting, change of runs, liming and cropping the soil must be adopted.

Fowl houses intended for roosting purposes only must be cleaned and scraped out every day and a liberal amount of sand, dry earth or sawdust thrown down on the floor or dropping boards to avoid the excreta soaking in to the wood or concrete. In damp weather it must be renewed just as soon as it shows the least sign of dampness. In dry weather it must be renewed when it becomes dusty, or gets too short, or smells. In all cases of outbreak of disease the litter should be renewed, and also after treating for worms of any kind. Litter should be slightly damped before being removed from the house. It makes it easier to handle, and prevents all the dust and loose pieces from falling through.

Some people favour the floorless house. It is a very convenient type for use on high ground on which water does not collect, but it must be small enough to be portable, and should be moved or to a fresh spot at least once a week, and the droppings removed, allowing the sun to get at the soil. A fixed house with no floor is an abomination.

Poultry refuse should be taken away right off the farm, and old litter should be burnt. Droppings, even of healthy birds, contain an enormous number of germs, and the excreta of sick fowls must contain millions of disease producing bacteria. It is through the droppings that

many common poultry diseases are spread. If the droppings are not frequently removed the birds tread on them, and carry the infectious material on their feet to the food troughs, water pots, or any grain lying on the ground. This contaminated food and water is soon taken up by the fowls, and any disease that is about rapidly spread.

The daily cleaning process removes only the visible dirt and filth. It does not do away with bacteria, germs, or insects, except those which happen to be taken away with the droppings. Every two months, or more often when disease is about, the houses should be sprayed with a good disinfectant.

Before disinfecting it is necessary to give the house a thorough cleaning. All corners, cracks and crevices should be well scraped out, for disinfectant will not penetrate lumps of filth, and a house which has only been half-treated is almost as bad as one which has been neglected.

POULTRY DISEASES

It is comparatively easy to prevent fowls from becoming ill, but once sickness gets in among them, it will be found extremely difficult to effect a cure.

The most common causes of illness among poultry are dirt, damp, overcrowding, bad food and water, ill ventilated houses, vermin, and very frequently, contagion. Lack of cleanliness is a prolific cause of disease. In serious cases instead of treatment with medicines the thing to be done is to kill the affected bird and bury it deep under ground or burn to ashes and bury the ashes.

The first thing to do when a fowl becomes ill is to remove it from the rest, and place it in a small, dry, warm and well ventilated house by itself. This will give the sick bird a chance to get better, and prevent the disease spreading through the yard. Sick poultry must be kept warm, fed properly and treated gently. The next thing to do is to find out and remove the cause or causes of the disease and give some preventive to the unaffected birds. The poultry house and the place where the sick is kept must be frequently disinfected with carbolic powder or phenyle mixed with dry sand or ashes in the proportion of 1: 16.

18. Bronze Turkeys.

The ailments of polutry may be divided into three categories namely common and simple ailments; serious but not infectious diseases; and infectious diseases. The common ailments are fledging, moulting, loss of feathers, scoly legs, soft crop, etc. All these diseases may be cured by the application of kerosene oil emulsion or some other embrocation and sometimes by giving a few doses of sulphur or Douglas' mixture.

The serious but not infectious diseases are apoplexy, bumble-foot, cramps, rheumatism, paralysis, vermin, white comb, wounds, step, and swelling of the oil gland. The treatment of these diseases are not same so it is better to deal with each one after another.

Apoplexy is generally caused by over feeding, exposure to the heat and close confinement. In this case a teaspoonful of Epsom salts, and after that two drops of Belladonna four times a day may be effective.

Bumble-foot consists of a gathering at the bottom of the foot. Paint the part affected with lunar caustic (silver nitrate) or tincture of iodine, or, if the foot is very bad, apply linseed poultices to it daily until the gathering is ripe, then lance it with a sharp knife, and take out all the matter. The wound should be properly washed with carbolic acid and Zumbuk or Elliman's Embrocation may be applied to the spot daily until cured.

Cramps are brought on by exposure to wet or keeping the bird in a damp place. Rub the affected legs with decoction of neem leaves and apply Elliman's Embrocation. Give internally Rhus Tox 1x and Bry. Alb. 1x alternately, one drop twice daily.

Rheumatism is very much like cramps, except that it is accompanied with swelling of the joint. The same treatment as for cramps is effective. Paralysis is incurable; it is best to destroy the bird. Vermin cannot be called a disease but frequently leads to it for want of rest, Lice, bugs, ticks and fleas may be included in this category. In order to remove these pests apply some kerosene oil and tar to the coops, nests, etc. Also sprinkle the birds with Keating's insect powder and rub their affected parts gently with this powder. Another remedy is to use a a mixture of 6 parts coconut oil, 1 part eucalyptus oil and 2 parts kerosene oil. Mix thoroughly otherwise it will injure the birds. Do not use it over sitting hens in any case, as the powerful kerosene will kill the chicks in the eggs. White comb and black rot of the comb are both troublesome diseases. These are caused by bad feeding and want of cleanliness. Give from half to one teaspoonful of Epsom Salts in a little warm water. Wash the affected parts with phenyle and water. Also rub the affected parts with the following ointment as prescribed by Mrs. M. V. Lord in her book "Poultry Keeping In India":—

Camphor	1	part
Phenyle	1	,,
Turpentine	2	parts
Coconut oil	4	,,
Boric acid	4	,,

Wounds of birds ought not to be neglected. Dress with a solution of potash permanganate. Apply some ground turmeric or ground sulphur. Seep is really consumption, and is incurable. The fowl eats, but is listless and grows thin. Try codliver oil. Swelling of the oil gland above the tail is another serious type of disease. To treat this take a stick of turmeric, hold the end over a fire. Press the burnt part over the swelling, do this 3 or 4 times, after that apply some ground turmeric. If matter has formed, then it is necessary to cut the gland and remove the pus and wash it with diluted phenyle and apply boric acid and sulphur.

Contagious diseases of poultry are chicken-pox, cholera, cold, diarrhoea, dysentry, scurfy face and comb. roup, canker, diptheria. These diseases may be treated after the affected birds are separated out from the flock. When the bird is attacked with chicken-pox give some indigenous medicines. 4 tolas root of chorchora or joga bailta, or thorn of silkcotton tree. Some homeopathic medicines like Rhus Tox 1-x., Aconite and Pulsatilla 1-x. alternately will be very effective. In case of cholera give chlorodine diluted with water or a small pill of the following:—

Sulphur	8	oz.
Charcoal	4	,,
Chalk	2	,,
Rootus	3	,,
Carbonate of iron	8	,,
Opium	¼	,,

Reduce into powder and make smal pills with a little water.

In case of cold the bird should be kept in a warm place, and have one drop of tincture of aconite 1x and arsenicum alb. 1x. alternately four times a day. When the bird is affected with diarrhoea give it a tablespoonful of olive oil or teaspoonfull of Epsom salts and give Ipecac 1x. two drops in a little water every 2 hours and then a dose of tonic mixture.

Dysentry is caused by bad feeding and dirty water. The bird may be treated in the same way as diarrhoea. Over and above those medicines prescribed under that head one drop of mercurious Car 3-x, with little water may be given every 2 hours. In case of birds affected with liver disease, their faces become pale and shrunken. Mild cases may be cured with cod-liver oil but it is very difficult to treat seriously affected birds, which may give rise to tubercular disease if not properly checked at the very beginning. Another type of disease is scurfy face and comb caused by fungoid growth of insects. This may be cured by applying the following lotion prescribed by Mrs. M. V. Lord:—

Eucalyptus oil	1	part.
Spirit of camphor	1	,,
Phenyle	1	,,
Turpentine	2	parts.
Coconut oil	4	,,
Flowers of sulphur	4	,,
Boric acid	4	,,

Apply this lotion after washing the parts with diluted phenyle.

Roup is the most dreaded disease for poultry. It begins with a common cold and gradually the whole face swells very much. A good remedy is as follows:—

Copper sulphate	⅛	gr.
Hydrostrino	1/16	,,
Balsam copaiba	2	,,
Cayenne pepper	2	,,
Calcined magnesia	2	,,
Liquorice powder	2	,,
Peepul fruit	2	,,

Mix with mustard oil and make into four pills—One pill to be given in the morning and one at night.

Canker is a malignant disease. It affects the eyes, head and face, but most generally the mouth and throat. The disease becomes worse until it suffocates the bird. The most affective treatment is to remove the canker with a sharp knife. After washing the parts with hydrogen peroxide apply camphorated oil, which gradually cure the bird.

Staggers is a kind of disease generally attacks young ducks, and especially those hatched from immature parents, or late in the season hatches. It appears to be a kind of meningitis and attacks ducklings from 4 to 6 weeks of age. Little can be done to cure it.

NATURAL ENEMIES OF POULTRY

While poultry existed under their wild conditions, nature gave ample protection against attack from animals and other birds to which they might fall prey. For instance, when in the jungle state a fowl's body was so light that she could fly from danger, and would instinctively roost high in the trees out of the range of foxes, etc.

By domesticating her we have also given her a sense of false security, and instead of always being prepared for her enemies she is now almost unsuspecting of danger and therefore in many cases unable to escape.

RATS

Of the many enemies rats are by far the greatest nuisance in a fowlhouse. If they are allowed to get into the house, they will cause irreparable damage. They have been known to steal eggs and chickens, and kill fowls four and six months old. Besides that carry disease into a fowl-house. If the walls and floors of the houses are made of bricks and concrete, the rats will not give much trouble.

but there is no way of keeping them out of a house made of mud or mats, unless the following plan as suggested by Mrs. M. V. Lord in her book "Poultry Keeping in India" is adopted:—Lay down half-inch mesh wire-netting on the floor, and run the wire-netting up the sides of the wall for about three feet. Over the wire-netting on the floor place four inches of dry sifted earth or sand, and put some cowdung and earth-plaster over the wire-netting on the sides of the wall. Corrugated-iron sheets may be used instead of wire-netting. By this means rats can be most effectually kept out of the house.

Broken glass can also be spread on the floor of the house before putting down the broken brick to make a pucca floor. This is most effective, as no rat can possibly burrow through glass.

It is no use trying to get rid of rats by poisoning them. The fowls will get at the poisoned food or dead rats and insects, and die the effects. The best thing is to catch the rats in traps and drown them.

SNAKE

Another enemy to guard against is the snake. Snakes get into the fowl-house through the rats' holes. The only way to keep snakes out of the house is to keep out the rats. It is easy enough to keep rats and snakes out of the fowl-house but it is almost impossible to keep the runs and yards free from them. The only way to keep snakes out of a run or yard is to constantly fill up the holes in the runs and clear away all the jungle and long grass. If some coaltar is poured into the holes and the mouth of the holes closed with bricks, rats and snakes will not get into them.

CATS

The cat, so useful to the poultry farmer in combating the menace of mice and rats, can herself be a pest where small chicks are concerned. It is the natural instinct for a cat to attack and kill a small wild bird, and baby chicks can be equally tempting. A mother hen allowed to wander round with her chicks is quite capable of looking after them, and very few cats would repeat an attack on a chick so well defended, but when the hen is confined to her coop or chicks are being reared extensively by artificial means it is most necessary to guard them from such an emergency.

A wire-netting fence six feet high is usually sufficient, providing there is no jumping-off place, to keep a cat at bay; otherwise a netted run should be brought into use.

The lower part of the run or fence should be made of not less than half-inch wire mesh, or the chicks will scramble through.

CROWS, ROOKS AND MAPIES

These can be particularly damaging to the rearing fields, attacking especially when they have young in their nests

In all cases they wait until the poultryman is away from the fields, drop on a chick and tear the flesh from the bones In the case of crows and rooks the body is carried off, but an attack by a magpie is always on the head and that part only is taken away.

The gun is the best protection from these birds and it is necessary for the farmer to lay in wait, hidden in a poultry house or hedge.

FOXES

Here we have the most destructive foes of poultry. The fox kills for the joy of killing, sometimes destroying dozens of chickens but carrying off only one as food. Very rarely will the fox make a raid close to its earth; it prefers to go a distance in search of its victims. The vixen, however, when she is feeding her cubs steals

chicken from a near-by run and stores them in the earth. At such times she will leave no trace behind her, the only check the farmer has on this is periodically to count his birds.

A fox is a wily customer to deal with, and the farmer sitting in wait with the gun must be certain he is not in the windward of the animal's usual run. Clams, baited with a hen that the fox has killed overnight, sometimes prove effective, but the hands should be covered before handling either the trap or the hen. The clam should be well staked, as in the trapping of a badger, and covered with some light brushwood.

Poisoning is one of the surest ways of getting rid of the fox.

DOGS

Country dogs which have been brought up among poultry seldom attack. It is of the town dog out for a day in the country that the poultry farmer has to beware.

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—PHARMACEUTICAL RECIPES

CHAULMOOGRA OINTMENT (B.P.)

Chaulmoogra oil	10	grams.
Hard Paraffin	40	„
White Soft Paraffin	50	„

Melt the hard and soft paraffins together, add the chaulmoogra oil, and stir until cold.

ANTI-CATARRHAL SALTS (B.P.)

Phenol	16.5	grams.
Eucalyptus oil	16.8	c.c.
Oil of Fir	8.25	„
Strong solution of iodine	8.25	„
Camphor	16.5	grams.
Ammoniated Alcohol	34	c.c.

Dissolve the phenol, camphor and the oils in the ammoniated alcohol, and add the strong solution of iodine. Saturate pine sawdust with the mixture and put in glass-stoppered bottles.

ANALGESIC BALSAM (B.P.)

Methyl Salicylate	50	grams.
Menthol	10	„
Eucalyptol	2.5	„
Oil of Cajuput	2.5	„
White Beeswax	20	„
Hydrous Wool Fat	15	„

Melt together the beeswax and hydrous wool fat, add the menthol dissolved in the mixed liquids, and stir until cold.

BROMPTON COUGH LOZENGES

Extract of liquorice	19.44	grams.
Oil of anise	2.96	c.c.
Simple basis	a sufficient quantity.	

Mix, and make into 100 lozenges.

The simple basis required above may be prepared as follows :—

Sucrose, finely powdered	100	grams.
Acacia, finely powdered	7	„
Distilled water, a sufficient quantity.		

Mix. This mixture is sufficient for making 100 lozenges as stated above.

TINCTURE OF PYRETHRUM FLOWER

Pyrethrum flower, in powder 250 grams.
Alcohol (60 per cent) to make 1000 c.c.
Prepare by the percolation process.

GINGER MINT TABLETS

Oleoresin of ginger	5	grains.
Sodium bicarbonate	2 oz. 125	„
Ammonium bicarbonate	25	„
Saccharin	4	„
Oil of peppermint	25	„

Granulate the oleoresin of ginger, sodium bicarbonate, saccharin and oil of peppermint, add the ammonium bicarbonate, and make into 200 tablets.

Dose—1 or 2 tablets.

AGUE MIXTURE

Quinine sulphate	½	dr
Sulphuric acid dil.	½	„
Syrup of orange	1	oz.
Glycerine	4	dr.
Water to make	8	oz.

Dissolve the quinine in the sulphuric acid then add the glycerine and syrup. Lastly make up the required volume by adding water. Dose 1 oz.

RESIN PLASTER

To prepare resin plaster, first prepare litharge plaster according to the following formula :—

Litharge, in very fine powder	6	lbs.
Olive oil	1	gallon
Water	1	quart.

Boil all the ingredients over a slow fire, constantly stirring to the consistence of a plaster, adding a little boiling water if nearly the whole of that used in the beginning has been consumed before the end of the process.

Now take this litharge plaster and proceed to make resin plaster in the following manner :—

Litharge plaster	72	lbs.
Olive oil	3	„
Pale yellow rosin	12	„

Melt the first two together in a bright and perfectly clean copper pan, and sift in the pale rosin, stirring all the while. Then allow the mixture to cool. Lastly pull or work in the usual way.

MOUTH WASH POWDER

Sodibicarb	8	oz.
Saccharin	1	„
Vanillin	20	„
Coumarin	20	„
Benzoic acid	20	„
Oil of cloves	½	dr.
„ caraway	½	„
„ lemon	½	„
„ wintergreen	½	„
„ peppermint	½	„
Carbolic acid	½	„
Oleo-resin capsium	½	„
Carmine	20	„

Mix thoroughly. One tea spoonful to be dissolved in half a wine glass of water and used as a mouth wash.

—Recipes for Small Manufacturers

UTILIZATION OF CORK WASTE

Cork-wood waste and virgin cork-wood, which are classed as waste, may be utilised in many ways. The best scrap is made into cork discs for the crown seal, and serves its purpose well.

This scrap is taken and granulated in an iron rotary cutter mill, to a degree of fineness that will pass a 1/5" mesh. It is then screened and mixed with a strong binder that has a wonderful holding quality; it is then dried by steam and pressed into sheets by hydraulic presses, dried again, and then stamped out in the usual manner. There is no waste to this process as the unused portions go back to the grinders again and through the usual process.

Granulated cork is made by grinding the waste in ordinary metal roller, cage or burr mills, and then screening same for the various degrees of fineness; if cork-flour is desired, a tube mill may be used.

Cork scrap is also utilised in the form of corkboard for insulating purposes.

The processes for the making of cork-board differ in many ways, widely divergent in principle. The cork-wood waste and virgin cork are broken up and chipped in an ordinary iron mill as a preliminary to all processes. In one, this chipped material is poured into iron moulds of the desired shape of the slab, subjected to heavy pressure and run into an oven keep at about 800°F. This oven, being a low brick type resembling a tier and heated by coal fires, the slab moulds being drawn through on an endless chain which runs at a speed to keep the cork just long enough, for the resin in same to exude and bind the little articles together; the cork is also charred in this process, thereby converting it into a carbonised cellulose which makes it an excellent material for insulation. Steam-heated hydraulic presses are also used for making small tiles, etc. being based on the same principle as above without the charring.

ORNAMENTING EGG-SHELL

Make a small hole at each end of an egg and blow out the contents; then cover the openings with sealing-wax and fasten on two matches as spindles. Make a support having a bottom piece 7 in. by ½ in. and two uprights with notched tops, each 4½ in. by 1 in. by ½ in., placed 5 in. apart. Melt white wax in a convenient jar, which must be placed on the stand between the uprights and under the egg, turning it round without fingering the shell. When dry, draw the required picture with a hard lead pencil, penetrating through the wax in order to expose the shell where lines are drawn. Next soak it in strong vinegar for twelve hours, putting something weighty over the jar to keep the egg under the liquid; the vessel should be narrow to prevent the egg floating horizontally. Go over the design with a needle, scratching away the corroded portions; then brush black writing ink plentifully over the egg, let it dry, and remove the wax with hot water very carefully, for the shell is liable to burst during this performance. The ink has soaked into the etched lines, and the picture shows up well on the uncoloured shell. A thin coating of mastic varnish improves the appearance.

AMLA MORABBA

Amla	3	lbs.
Sugar	4	„
Curd	1	lb.
Salt	2	oz.
Lime	180	grains.
Lemon	1	

First soak the amlas in an earthenware vessel full of water for about one hour. Throw away the water and repeat the process once more with fresh water. Then wash the amlas and drain off the water. Now make incisions on all sides of the fruits and allow them to soak for half an hour in a solution made by dissolving half the lime in water. Take the amlas out and allow them to soak in a solution of the remaining lime water for half an hour. Take them again out and wash in water. Now prepare a suitable quantity of whey by dissolving curd in water and soak the amlas in it for 1½ hours. Now boil them in the whey and when whey becomes discoloured throw it away and again boil the nuts in the remaining quantity of whey for 1½ hours. Ladle them out and wash in clear water; then add a few drops of lemon juice, a quantity of salt and curd. Next prepare a thin syrup and cook them in it over a gentle fire. Remove when of the consistency of the morabba. Bottle when cool.

—IN THE FIELD OF INVENTION

INSULATING BOARD FROM STRAW

A new process for making insulating building boards from wheat straw has been recently developed by the Bureau of Agricultural & Industrial Chemistry, U.S. Department of Agriculture. This development promises to help straw to compete with sugarcane bagasse and wood-pulp as a raw material for insulating boards.

The procedure consists of blending ordinary straw pulp used in making straw-board boxes and packing materials with a new type of pulp which is relatively less expensive and contributes increased strength and other desirable qualities to the product.

The new pulp is made by cooking the straw in water without chemicals at atmospheric pressure and running it through a "disc refiner" which breaks down the straw fibres into bundles of fine strands. The special properties of the pulp are due largely to the fact that half of its fibres are relatively narrow and slightly less than 1" long. By blending the two pulps in varying proportions, it is possible to produce boards with a wide range of densities greater strength at the same density than most commercial boards made from wood fibre and exceptional "impact strength."

—JOURNAL OF SCIENTIFIC & INDUSTRIAL RESEARCH.

A NEW PLASTICIZER

Urea-formaldehyde adhesives for plywood, veneer board etc., tend to be very brittle after they set. These adhesives are apparently quite difficult to plasticize and their use has been limited along the lines mentioned, for this reason. Coatings and impregnations of textiles, paper, etc., with urea-formaldehyde resins and compositons suffer from the same disadvantage.

The incorporation of about 2 per cent. Diglycol Stearate S in such products plasticizes them effectively, preventing them from becoming brittle. The bonding action is not affected. Diglycol Stearate S is a white, waxlike product having a slight agreeable fatty odour.

Diglycol Stearate S is made by the Glyco Products Co., Inc., Brooklyn, N. Y. and Natrium, West Virginia.

—CHEMICAL PRODUCTS.

MAGNETIC SEPARATOR

Essential features of the new "Rapid" twin drum electro-magnetic separators for the treatment of magnetite ore are the intense magnetic fields employed to extract the selective particles of ore as they pass through the magnetic barrier, depending upon their permeability.

Magnetite ore, being feebly magnetic, can be efficiently separated in large quantities by this means. Each machine, capable of treating 40 tons per hour of mined ore, employs dual electro-magnetic drums to produce the magnetic fields through which the ore has to pass. The ore is reduced to approximately 1 in. mesh and fed into the hopper mounted on top of the machine, with an adjustable feed gate, which regulates the ore on to a vibrating feed tray, actuated by heavy duty ball bearing eccentrics, and delivers it in a continuous stream on to the top of the first magnetic drum.

Each drum consists of a cylindrical cover fixed to flanges, which revolve on the stationary shaft, to which is fitted an electro-magnetic unit, which radiates a uniform field of high intensity through the front half only of the drum.

The complete machine is built on a channel section fabricated steel framework, rigidly braced to withstand vibration extended by the vibrating feed tray and is totally enclosed to eliminate dust. Total weight of the complete machine being 7 tons.

—CHEMICAL PRODUCTS

NEW SYNTHETIC FIBRE

Fibres from cotton-seed protein and chemically modified cellulose produced experimentally at the U. S. Bureau of Agr. & Ind Chemistry's Res. Lab., are described (Chem Age, 1949, 61, 64).

Cotton-seed fibre is obtained by a special acid treatment of the proteins from solvent extracted cotton-seed meal. This changes the structure of the protein, corrects its tendency to gel or lump in untreated dispersions, and makes it suitable for spinning.

The fibres from sodium carboxymethy cellulose (a soluble compound made from wood or cotton cellulose) are derived by extruding its solution in water through a spinerette into a bath containing the salt of one or more o heavy metals. The fibres being soluble in soapy water or other weak alkali solutions (similar to alginate fibres from alginic acid, a constituent of sea weed), are considered suitable for use as a spacing agent—to provide the "missing threads"—in specially woven fabrics.

—JOURNAL OF SCIENTIFIC & INDUSTRIAL RESEARCH

—FORMULAS, PROCESSES & ANSWERS

THYMOL.

156 R.P.P., Davol—Desires to learn the process of making thymol crystals.

In order to prepare thymol from ajowan seeds a stout distilling vessel of cast-iron is fitted with a condenser and receiver. A fairly large quantity of ajowan seed is put into the vessel according to its capacity and a quantity of water is then poured to cover the seeds just immersed in it. On heating the oil of thyme is distilled over. It is condensed and collected in a receptacle placed in the further end of the condenser. The oil is then separated from water by decanting the upper layer.

Thymol is isolated from this volatile oil by shaking the latter with an equal volume of warm sodium hydroxide solution (sp. gr. 1.33) and after several hours the mixture is diluted with 2.3 volumes of hot water. The aqueous portion, which contains the thymol in solution, in the form of its sodium salt is separated and acidified. The precipitated thymol is dried and distilled at 220°-235°C is seeded with a crystal of pure thymol and set aside in a cold place. The crystallised thymol is separated by filtration and purified by recrystallisation from petrol.

ETCHING ON STEEL.

221 M.M.J., Rawalpindi—Wants to have a method of etching on steel.

In attempting to etch on steel and to attain sufficient depth, the chief difficulty lies in finding an acid resist that will adhere to the steel. Either zinc or copper sensitizer can be used. For etching, use solution of ferric chloride, 35° to 38° Beaume to which is added a small amount of concentrated hydrochloric acid.

Another solution of etching steel is as follows:—

Nitric acid	32	parts.
Hydrochloric acid	3	„
Denatured alcohol	66	„
Water	96	„

Mix. Use this as etching fluid.

PIMPLE CREAM.

224 M.A.R., Hyderabad, Deccan—Desires to know a good formula of pimple cream.

Lactic acid	3	parts.
Citric acid	7	„
Water	40	„
Lanolin	40	„
Cetyl alcohol	100	„
Soft paraffin	800	„
Rhodinol	10	„

Dissolve the acids in the water and beat into the melted mass of lanolin and soft paraffin. Then add the rest of the ingredients and emulsify for a few minutes.

CHYAVANPRASA.

239 S.C.D.P., Saktipur—Wishes to have a formula of preparing chyavanaprasa.

Chyavanaprasa, an Ayurvedic preparation so familiar among the people is composed of the following drugs:—

Barks of Aegle marmelos, Premna serratifolia, Bignonia indica, Gmelina arborea, Bignonia suaveolens, the roots of Sida cordifolia, Hedysarum gangeticum, Doodia or Uraria lagopoides, Phaseolus trilobus, Glycine debilis, the piper longum, Tribulus languinosus, Solanum zanthocarpum, Rhus succedanea, Phyllanthus niruri, Grapes, Caelogyne ovalis, Aplotaxis auriculata, Aquilaria agallocha, Chebulic myrobalans, Tinospora cordifolia, Riddhi (not being obtainable, Bala or Sida cordifolia is used), Jivak (not being obtainable, Tinospora cordifolia is used), Rishabhaka (Bhumi Kushmanda or Bamboo Manna is used), Curcuma zerumbet, the tubers of Cyperus rotundus, Boerhavia diffusa, Meda (Withania somnifera; not being obtainable Cassia fistula is used), Elettaria cardamomum, Nymphae stellata, Red sandal wood, convolvulus paniculatus, the roots of Justicia adhatoda, the root called Kakoli, & Leea hirta. Take one pala of each of these. Take also 500 fruits of Phyllanthus Emblica and tie them loosely in a piece of cloth. Boil all these together in 64 seers of water down to 16 seers and strain the decoction. Throw out the seeds of the myrobalans and taking the remnants of the fruits, fry them in 6 palas of ghee and 6 palas of sesamum oil mixed together. The fried product is then to be reduced to paste, with 50 palas of sugar candy. When the boiled matter assumes some degree of consistency, throw into it bamboo manna 4 palas, the powder of Piper longum 2 palas, that of the bark of Cinnamomum zeylanicum 2 tolas, that of the leaves of Cinnamomum tamala 2 tolas, that of Cardamoms 2 tolas, and that of the flowers of Mesua ferrea 2 tolas, and stir the contents. When cooled, add 6 palas of ghee and keep the compound in a jar long in use for storing ghee. Dose.—½ to 2 tolas, vehicle being goat's milk.

This is a nutritive tonic, useful in phthisis, and improves all conditions of debility.

PURGATIVE PILLS.

248 M.Z., Vile Parle—Wishes to have a recipe of purgative pills.

Aloes	45	grains.
Powdered rhubarb	32	,,

Mix into 60 pills with syrup of orange.

CHALK CRAYONS.

247 M.N.N., Ahmedabad—Wants to have a formula for making chalk crayons.

WHITE

Precipitated chalk	40	parts.
Plaster of Paris	45	,,
Lithopone	10	,,
Glue solution	5.10	,,

Knead all together to make a soft dough and pour into gun metal moulds. When set take out and allow to dry in air. Then put all together in a tray and moderately bake over mild fire.

BLACK

Soapstone	28	lbs.
Gypsum	20	,,
Bone Black	8	,,

Mix and make into a stiff paste, with thin glue or gum, mould and dry gradually.

YELLOW

Chalk	28	lbs.
Soapstone	18	,,
Pipe clay	10	,,
Yellow ochre	6¼	,,
Medium lemon chrome	1½	,,

First well mix ochre and chrome, then add to others, making a paste as before.

BLUE

Soapstone	15	lbs.
Gypsum	15	,,
Chinese blue	1¼	,,

Proceed as before.

GREEN

Gypsum	35	lbs.
Soapstone	25	,,
Pipeclay	30	,,
Lemon chrome yellow	7	,,
Chinese blue	6	,,

Mix Chinese blue and chrome together; add to others, making and moulding as previously.

RED

Whiting	15	lbs.
Soapstone	28	,,
Pipeclay	10	,,
Indian red	7	,,
Venetian red	1½	,,

Proceed as before.

RUG CLEANING SOAPS.

The combination of a soap and a chlorinated or hydrocarbon solvent produces an excellent rug and carpet cleaner. An emulsion of solvent, soap, and water removes grease, tar and paint more readily than does soap and water. The amine soaps, being soluble in the solvents, allow the preparation of clear solutions of solvents, soap, and water, which can be stored indefinitely without separation. The colours in the rugs of carpets will not be harmed, but will be clarified and brightened by the cleaning process.

Oleic acid	28	parts
Ethylene dichloride	13	,,
Isopropanol (99%)	14	,,
Butyl cellosolve	5	,,
Triethanolamine	16	,,
Water	125	,,

Mix the oleic acid, ethylene dichloride, isopropanol, and butyl cellosolve; and add the triethanolamine. Stir until thoroughly mixed and add the water. If the mixture is cloudy add sufficient isopropanol to clear it.

An emulsion made of equal volumes of the above soap and water is used for cleaning rugs and carpets.

While preparing the above soap special care should be taken to avoid inhaling the vapour and repeated contact with the skin whenever chlorinated solvents are used.

PAPER VARNISH.

250 S.M.D., Ambala Cantt.—Wants to have a good formula of paper varnish.

African copal	4	oz.
Powdered glass	4	,,
Camphor	1	,,
Ether	20	,,

Macerate for a month, then add Absolute Alcohol 5 oz.

Again macerate for two weeks, and decant the clear varnish.

OFFICE GUM.

Gum arabic	10	parts.
Starch	10	„
Sugar	40	„
Boiling water	100	„
Salicylic acid	2	„

Dissolve the gum arabic in half the quantity of boiling water and then mix the starch and sugar and finally add the remaining boiling water and salicylic acid.

TIN SLATE

267 B. R. S., Phagwara—Desires to have a process of making tin slate for school children.

First prepare the silicate solution by finely crushing equal parts of solid potash and soda silicate and pouring over this 6 times the quantity of soft river water, which is kept boiling for about 1½ hours, whereby the silicate is completely dissolved. Next take 7 parts of slate finely ground with a little water into impalpable dust and mix with 1 part lamp black. Grind enough of this mass with the previously prepared silicate solution as is necessary for a thick or thin coating. With this compound rough tin plates are painted uniformly and allowed to set.

EMBOSSING INK FOR LEATHER INSOLES

318 S. A., Trichy—Wants to know a process of embossing ink for leather insoles.

Cellulose nitrate	9	parts.
Bronze powder	20½	„
Castor oil	10½	„
Ethyl acetate	10½	„
Ethyl alcohol	15½	„
Butyl acetate	34½	„

Mix.

BLEACHING GUT

315 M.N.M., Khatauli—Desires to know a process of bleaching gut.

After cleaning the membrane the gut becomes semi-transparent. This may be bleached by soaking 6 to 12 hours in a dilute solution of potassium cyanide (½ oz.) dissolved in a gallon of water. Then the strands are taken out of the solution and after a thorough washing in water are rubbed with a clean shell to reduce their thickness and to separate any extraneous matter. Three basins are then placed in a row, all the strands are placed in the basin on the right hand side. The knotted ends are held in the left hand and the sippi held by the thumb; a slight pressure is exercised to squeeze out the water. The refuse and the water fall into the middle basin and the cleaned strands are put into the third. This is repeated three or four times and finally, the sippi is applied with no water.

But the guts which are to be prepared for other colours than black are given another bleaching bath by immersing the strands in a solution containing ½ oz. each of potassium cyanide and potassium carbonate dissolved in a gallon of water. The material is turned over frequently to expose fresh surfaces to the bleaching agent and then left to soak overnight. In the morning it is taken out and thoroughly washed with frequent fresh supplies of cold water. Then it is soaked again for 4 to 6 hours in a solution of 1 oz. of hydrogen peroxide and ½ oz. of sulphuric acid in a gallon of water and washed thoroughly and scraped.

NAIL POLISH

327 G.S.S., Amritsar—Wants to have formulas of nail polish, metal polish etc.

Ethyl acetate	50	parts.
Butyl acetate	20	„
Diethyl phthalate	15	„
Camphor	4½	„
Nitrocellulose lacquer	10	„
Eosine	½	„

Mix all the ingredients together and keep aside in a stoppered bottle. When dissolved, mix the eosine after dissolving it in a little ethyl acetate.

LIQUID METAL POLISH

Soap Flakes	300	grams.
Borax	60	„
Trisodium phosphate	30	„
Water	3000	c.c.
Ammonia (strong)	150	„
Pine oil	300	„
Silica	900	grams.
Denatured alcohol	60	c.c.

Heat about 2/3 of the water and dissolve in it the soap and salts. Put the silica in a pail and mix with the pine oil. Add ammonia to the soap solution and add this slowly, triturating constantly to ensure a homogeneous mixture. Once a good paste is formed, it may be thinned with more solution, and when thin enough, the rest can be added, all at once. Stir until it becomes thick again, usually a few minutes. The rest of the water is best added cold to hasten the cooling of the product. When cold, stir in alcohol.

LIPSTICK

Spermaceti	31	oz.
Hard Paraffin	5	„
Cocoa butter	7	„
Cholesterin	26	„
Castor oil	4	„
Benzoated lard	8.5	„

Perfume	.3	oz.
Benzoic acid	.1	„
Bromo acid (acid eosine)	2.5	„
Colour	10	„

Dissolve the bromo acid in the butyl stearate, add the castor oil. Mix the cholesterin and benzoated lard. Add the bromo acid mixture and the colour. Mix thoroughly and run the mass through a mill four times. Then melt the spermaceti, the paraffin and cocoa butter, and add the colour mass. Mix thoroughly and add the perfume and benzoic acid. When the mass reaches 110°F keep the temperature of the batch at this point while filling the moulds. The best way to do this is to use a small insulated pouring pot which will hold enough to fill one set of moulds. This can be replenished from the main supply from time to time.

SOLE FINISH

328 R. N., Kanpur—Wishes to have formulas of sole finished and shoe edge ink.

Pipeclay	2½	oz.
Iron peroxide	½	dr.
Boric acid	1	„
Citronella oil	5	mins.
Gelatin	1½	dr.
Water	10	„

Sock the gelatin in the water until soft, add the acid, and dissolve by heat. When cold gradually add to the other ingredients previously well triturated.

SHOE EDGE INK

Montan wax	14	parts.
Caustic potash	2	„
Nigrosine	3	„
Water	81	„

Dissolve the dye in the water and also dissolve the caustic potash in it. Now mix the whole, while stirring to the molten wax.

EXTRACTION OF GOLD FROM SOIL

387 K. S. T., Ramaswaram—Desires to learn the process of extraction of gold from soil.

Extraction of gold from soil may be carried out by simply putting sand into wooden bowls and washing it gradually with water.

ENAMELLING COPPER WIRE

427 K. E. W., Banaras Cantt.—Desires to know a good process of enamelling copper wire.

To enamel copper wire suitable for ele trical purposes first prepare an insulati composition by melting 2 parts of aspha together with 2/5 part sulphur and adding this mixture 5 parts of linseed oil varnis Next keep the temperature of the whole 320°F for 6 hours. After this allow it to coo When cold add oil of turpentine sufficient make the mass as thin as syrup. Now stretc the well cleaned copper wire and apply thi composition evenly by means of a brush or othe suitable arrangements. When dry beautif black lustrous elastic enamel produces over th wire. When transparent colourless enamel required coat the copper wire with shella varnish prepared with linseed well containin a little castor oil ; of course the varnish shoul be prepared with bleached shellac.

INSULATING VARNISH

Melt 2 parts of asphalt together with 0.4 parts of sulphur. add 5 parts of linseed-oil varnish, linseed oil or cotton-seed oil, keep at 320°F for 6 hours, next pour in oil of turpentine as required.

HAIR CREAM

355 S. D., Coonoor—Wishes to have recipes of hair cream and mouth wash.

White beeswax	10	parts
Paraffin oil	130	„
Distilled water	15	„
Borax	1	part
Perfume	3	parts.

Melt the wax in 50 parts of paraffin oil Place in a mortar and stir in the remainder of the liquid paraffin. Add the distilled water in which the borax has been dissolved and stir the cream formed consistently until cold.

SOAPY MOUTH WASH

Powdered neutral soap	20	parts.
Glycerin	90	„
Peppermint oil	6	„
Wintergreen oil	2½	„
Cinnamon oil	1	part
Clove oil	½	„
Alcohol	300	parts.
Distilled water	580	„

Dissolve the soap in the distilled water and mix the glycerin. In another vessel dissolve the oils in the alcohol. Finally mix this with the, soap-glycerin solution. Shake and then keep aside to clear.

—BRIEF QUERIES AND REPLIES

Questions of any kind within the scope of Industry are invited. Enquiries or replies from our experts will be published free of charge in serial order. Questions are replied by post on receipt of As. 8 stamps for each question. Subscribers outside India are requested to send two International Reply coupons for each question. In order to facilitate the work of Editor's Department and to help prompt action the readers are requested to send enquiries in separate letters.

2887 A.S.J., Ferozepore Cantt.—For clarified paraffin you may enquire of Calcutta Chemical Co. Ltd., 10, Bonfield Lane. Calcutta. You need not take any drug license. Import restriction is applicable to importing goods by post also.

2888 B.S.S., Saklaspur—It is not possible to fill carbon dioxide gas in iron cylinder on cottage industry scale. It is not possible to recharge exhausted dry cell.

2889 S.K.P., Ahmedabad — For machines required for printing ink enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta and Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta.

2890 T.P.U., Mathurai—For rubber gloves enquire of Bengal Waterproof Works Ltd., 32, Theatre Road, Calcutta and Bhattacharyya Rubber Works, 174, Jessore Road, Dum Dum.

2893Y.J., Gunture — For knitting machine enquire of A. N. Sayal & Sons, 8B, Lall Bazar Street, Calcutta.

2897 E.T.C., Trichinopoly—For the yarn required enquire of Acme Thread Co., 37, Canning Street, Calcutta and Chittaranjan Chrochet Cotton Mfg. Co., 37, Ghose Lane, Calcutta.

2898 M.A.K., Karachi—Process of manufacturing chocolate and dyeing cloth will appear in Formula Section in due course.

2900 G.C., Coimbatore—Mosaic gold is an alloy composed with slight deviations of 100 parts of copper and 50 to 55 of zinc. It has a beautiful colour closely resembling that of gold and is distinguished by a very fine grain, which makes it specially suitable for the manufacture of castings which are afterwards to be gilded.

2902 D.P.S., Lucknow—For toilet goods and general merchandise enquire of Reliable Stores, A-27, New Market, Calcutta 13; Indra Prasad Gupta, 2, Khengrapatti Street, Calcutta and Rajasthan Importing & Trading Co., 11, Armenian Street, Calcutta.

2904 S.W.P., Nagpur City—Process of manufacturing lithographic varnish will appear in Formula Section in due course.

2905 N.R.R., Coimbatore—Luminous paint is applied to clock dial. Following is a formula of luminous paint: Strandium carbonate 100 parts; sulphur 30 parts; sodium carbonate 2 parts; sodium chloride 0.5 parts; manganese sulphate 0.2 part. The materials are heated for three quarters of an hour to one hour, to about 237°F. The product gives deep yellow light.

2908 R.R.B., Chaibasa—For sewing thread you may enquire of Acme Thread Co., 37, Canning Street and Bengal Sewing Cotton Co., 11, Parsi Church Street; both of Calcutta.

2909 J.L., Jullundur Cantt.—For caustic soda manufacturing plant you may enquire of Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta. There are only two factories in India manufacturing caustic soda by electrolysis process. For starting such a factory you have to invest Rs. 10 lakhs. You may use any kind of soap powder. Soap powder may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta. In place of wheat flour you may use starch.

2911 G.D.N., Amritsar—Process of manufacturing gut will be found in Utilization of Common Products published from this office, price Rs. 3/7/- including postage.

2912 T.M.F., Madura—Following is a formula of liquid face powder; Magnesium carbonate light 15 parts; zinc oxide, light 1.5 parts; salicylic acid 0.1 part; alcohol (90 p.c.) 7 parts; ponceau U.R. (1:100 solution) 0.1 part; casein (1:100 solution) 0.03 part; rose water 86.3 parts; special perfume 1 part. Process of manufacturing vinegar appeared in October 1949 issue of Industry.

2913 M.P.P., Bilaspur—For bobbins enquire of Ariadah Bobbin Factory, 86B, Netaji Subhas Road; B. K. Desai & Co., 40, Tangra Road and Bobbin Manufacturers Ltd., 191, Chittaranjan Avenue; all of Calcutta.

2919 P.H.G., Kalyan Camp—Process of hydrogenation of oils will be found in Vegetable Oil Industry published from this office, price Rs. 3/7/- including postage.

2920 M.J.P., Nagpur—For detailed information on tannic acid and acetic acid manufacture consult a chemical expert who will advise you.

2921 B.N.C., Calcutta—For cement enquire of Assam Bengal Cement Co. Ltd., 7, Wellesley Place; Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road; Dalmia Cement & Paper Marketing Co. Ltd., 9, Dalhousie Square East and Kilburn & Co. Ltd., 4, Fairlie Place; all of Calcutta.

2922 I.C.P., Colombo—You may refer your query to Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane and Indian Mineral Industries Ltd., 22/1, Dum Dum Road; both of Calcutta.

2923 T.C.B., Tarikere—For fabricated span etc. enquire of Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road, Calcutta. For cinema accessories enquire of Ama Limited, Canada Bldg., Hornby Road, Bombay; Cine Agency (India), Parekh Bldg., 18, New Queens Road, Bombay and International Talkie Equipment Co., 17, New Queens Road, Bombay 4.

2924 H.A., Lucknow—Following is a list of newspapers; Journal, New York; The Sun, New York; Daily Express, Fleet Street, London E.C. 4; Daily Mail, Northcliffe House, London E.C.4; Der Agriff, Berlin; B.Z. Am., Miltag, Berlin; Japan Times and Mail, Tokyo, Japan and Japan Exporter, Tokyo.

2926 P.L.J., Sonepet—Coal may be had of Amritlal Ojha & Co. Ltd., 102/A, Netaji Subhas Road; Bengal Coal Co. Ltd., 8, Clive Row and Gillanders Arbuthnot & Co., 8, Netaji Subhas Road; all of Calcutta.

2927 M.P.L., Bhavnagar—Collapsible tubes may be had of Metal Box Co. of India Ltd., B2, Hide Road, Kidderpur, Calcutta.

2931 M.S., Komarapalayam—For jute yarn enquire of Birla Jute Mfg. Co., Ltd., 8, Royal Exchange Place, Calcutta and Champdany Jute Mill, Baidyabati, E.I.Ry.

2932 R.M.C., Tinnevelly—Refer your query to The Controller of Imports & Exports, New Delhi.

2933 N.K.C., Jamshedpur—Stationery goods may be had of Calcutta Stationery Hall, 56, Radha Bazar Street, Calcutta; Nilmony Halder & Co., 11, Chittaranjan Avenue, Calcutta and P. Sur & Co., 14/2, Old China Bazar Street, Calcutta. For oil board you may enquire of United Cardboard Co., 10C, Santosh Mitra Square, Calcutta. For emery powder and grinding wheel enquire of A. T. Ali Husain & Co., Strand Road, Calcutta and Buher & Co., 6 & 7, Netaji Subhas Road, Calcutta.

2937 R.M.S., Raipur—Reply to your letter has been sent by post.

2938 I.T., Jalgoan—Taral alta may be had of Maya Products Co., 10-1A, Nebutala Row, Calcutta; J. B. Dutt & Co., 2, Ram Krishna Lane, Calcutta 3 and United Chemical Works, 18, Haralal Mitter Street, Calcutta.

2939 P.I., Delhi—Following is a formula of thinner: Petrol or solvent naphtha 50 per cent.; alcohol 15 per cent.; ethyl acetate 15 per cent.; butyl acetate 20 per cent. One pint of this thinner should be added to 1 gallon of paint.

2940 K.V.S., Periyapatna—For grafts and plants you may enquire of Globe Nursery, 26, Ramdhone Mitter Lane, Calcutta and National Nursery, 46, Ramdhone Mitter Lane, Calcutta.

2941 E.P., Madras—For thinner enquire of Murarka Paint & Varnish Works Ltd., 4E, Dalhousie Square, Calcutta and Jenson & Nicholson (India) Ltd., 2, Fairlie Place, Calcutta.

2942 K.M.S.A., Trichinopoly — Process of enamelling will be found in Independent Careers for the Young which you have already got.

2943 O.N.C., Jullundur—Sample sent by you is of Watersoluble nigrosine which may be had of Champalal Agarwala, 45, Armenian Street, Calcutta.

2944 J.B., Aligarh—We have no book on plastic manufcture. An article on plastic industry appeared in December 1948, issue of Industry. Plastic articles are manufactured from plastic powder in India.

2946 S.K.M., Bombay — For addresses of American tourists and insurance companies enquire of Consul General for America, 9 10, Esplanade Mansion, Calcutta. Following is a list of newspapers: Rangoon Times, Rangoon, Rangoon Daily New, Rangoon; Ceylon Daily News, Colombo; Times of Ceylon, Colombo, Daily Gazette, Karachi; Karachi Daily, Karachi; Daily Telegraph, Sydney and Central Daily News, Nanking, China.

2948 B.L.S., Aligarh—Formulas of face powder, cream, etc. will be found in Indian Perfumes, Essences and Hair Oils published from this office, price Rs. 3/7/- including postage. You may also consult Manufacture of Soap published from this office, price Rs. 4/7/ including postage.

2949 S.L., Delhi—Oils should be heated on waterbath, so that no deterioration takes place when boiled. For manufacturing pyrotechnics you should secure license under Explosives Act. Barium sulphide and sodium sulphide deteriorate by water in air.

2951 S.N., Karnal—We have no book on poultry farming. You may however enquire of Standard Literature Co. Ltd., 13/1, Old Court House Street, Calcutta and W. Newman & Co., 4, Old Court House Street, Calcutta.

2954 H.S.M.C., Gulbarga—For aromatic chemicals enquire of Paradise Perfumery House, 7, Colootola Street, Calcutta; Calcutta Chemical Co., Ltd., 10, Bonfield Lane, Calcutta and Ghose Bros., 50, Ezra Street, Calcutta.

2955 S.H., Katmandu—Address of Film India is 104, Apollo Street, Fort, Bombay.

2962 S.N.G., Ranchi—Rock salt (saindhab) is obtained from salt mountains whereas ordinary salt is obtained by concentrating and crystallising sea or other saline water. So it

not possible to convert ordinary salt to rock salt. Process of manufacturing rubber balloons will be found in August 1948 issue of Industry.

2964 S.K.M., Bombay—Specimens of bonds, agreement etc. are not available. You better consult a lawyer. All other information you require will be found in Industry Year Book and Directory. Refer to No. 2946.

2965 D.K.J., Meerut—For grinding machines enquire of Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension and Balmer Lawrie & Co., Ltd., 103, Netaji Subhas Road; both of Calcutta.

2967 K.M., Ludhiana—You may enquire of International Book House, Ash Lane, Opp. Clock Tower, Fort, Bombay; W. Newman & Co., Ltd., 3 & 4, Old Court House Street and Thacker Spink & Co. (1933), Ltd., 3, Esplanade East, Calcutta.

2968 M.P.S., Baraut—For fountain pen engraving machine enquire of Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension, Calcutta. Price of Industry Year Book and Directory is Rs. 16-4 including postage.

2969 H.S.R., Ludhiana—Tea may be had of B. K. Saha & Bros. Ltd., 5, Pollock Street, Calcutta; Imperial Tea Co., 4, Raja Woodmunt Street, Calcutta and Metropolitan Tea Corporation, 34, Ezra Street, Calcutta.

2970 M.P., Arrah—Electroplating equipments may be had of Alfred Herbert (India), Ltd., 13-3, Strand Road, Calcutta.

2972 S.K., Barisha—You may use red lead in place of prepared lead and zinc oxide in place of prepared zinc powder.

2974 M.L.G., Loharpur—For ampoules and other glass apparatus write to Indian Glass Blowing & Mfg. Co., 4, Ramratan Bose Lane; Premier Scientific Glass Co., 26-2A, Prosonna Kumar Tagore Street and Scientific Glass Apparatus Co., 5A, Prosonna Kumar Tagore Street, all of Calcutta.

2979 R.,P.S., Chapra—Pocket Stove's refill is solidified methylated spirit. Following is a formula of solidified methylated spirit: Stearic acid 315 grains; carbonate of soda 35 grains; methylated spirit 16 fl. oz. Melt the stearic acid, add the soda dissolving in a small amount of water. When saponified add the methylated spirit. Stir until about to set. Pour in tin pots and put up the lid and keep aside.

2981 A.K.M.R.C., Perundurai—Aerated water making requisites may be had of Essence and Bottle Supplying Agency, 14, Radha Bazar St., Calcutta.

2982 B.C., Dhuri—Refer your query to Indian Turf Club, 13, Russel Street, Calcutta. Industry Year Book & Directory is published from this office. Thacker's Directory is published by Thacker Spink & Co. (1933), Ltd., 3, Esplanade East, Calcutta. German and Japanese Consulate General's Offices have not yet been opened.

2983 M.S., Athgarh—Particulars regarding ink manufacture will be found in Manufacture of Inks which you have already got. Earthen utensils are generally used for manufacturing ink. These you may procure locally.

2987 S.W.C., Simla—For envelope cutting press enquire of John Dickinson & Co., 6, Clive Row, Calcutta and Printing & Industrial Machinery Ltd., Windsor House, P-14, Bentinck Street, Calcutta.

2988 P.W.C., Kalyan Camp—For watch parts enquire of B. K. Ghosh & Co., Ltd., Great Eastern Hotel Arcade, Calcutta and Roy & Co., 136, 137, Radha Bazar Street, Calcutta. Process of electroplating will be found in Electroplating in Practice published from this office, price Rs. 3-7 including postage.

2990 R.V.L.P., Sivakasi—A good formula of snow appeared in October 1948 issue of Industry. Chemicals your require may be had of Calcutta Chemical Co., Ltd., 10, Bonfield Lane, Calcutta.

2991 K.K., Travancore—Process of manufacturing jintan, incense sticks will appear in Formula Section in due course.

2994 T.P., Barwaha—Process of manufacturing mirror appeared in May 1947 issue of Industry. You may also consult Independent Careers for the Young published from this office.

2996 T.G.C., Calcutta—For particulars regarding Vidyasagar Cotton Mills Ltd., enquire of Registrar, Joint Stock Cos., Bengal, P-29, Mission Row Extension, Calcutta. Sewing thread ball making machines may be had of Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension, Calcutta. Sewing thread may be had of Acme Thread Co., 37, Canning Street and Chittaranjan Crochet Cotton Mfg. Co., 37, Ghose Lane; both of Calcutta.

2997 M.C., Neemuch—Process of manufacturing soyabean oil will appear in Formula Section in due course. Peppermint oil is obtained by distilling the herb. For manufacturing thymol crystal you have to invest at least Rs. 25,000. Plastic industry can be started with Rs. 5,000 on a small scale. For starting pottery industry you have to invest at least Rs. 25,000.

2998 M.S., Trichur—Process of blueing gun barrels will be found in November 1949 issue of Industry. Paper pipe making machines are not available in India at present. You may however enquire of John Dickinson & Co., 6, Clive Row, Calcutta.

2999 V.I., Amritsar—Vide No. 2994 above. An article on plastic industry appeared in December 1948 issue of Industry. An article on colour-

Cawnpore; Riayasat, 82, Hamilton Road, Delhi; Daily Haqiqat, 68, Jagat Narain Road, Lucknow and Oudh Akbar, Hazratganj, Lucknow.

3074 H.L.S., Lohardaga—Address of Western India Match Co., Ltd., is Alambazar, near Calcutta.

3075 B.P., Nagpur— Reply to your letter has already been sent by post.

3076 S.K.M., Indore—For plastic machine enquire of Francis Klein & Co., Ltd., 1, Royal Exchange Place and Alfred Herbert India Ltd., 13-3, Strand Road; both of Calcutta. Moulding powder may be had of Imperial Chemical Industries India Ltd., 18, Strand Road, Calcutta.

3080 N.S.P.B., Kathmandu—Burn sulphur and pass the fume produced through the gum solution.

3081 N.I.L.W., Ludhiana—For tanning machines enquire of A. M. Banerjee, 34, Ezra St., Calcutta; Greenshields Jas & Co., Ltd., 68, Gordon Street, Glasgow and Aitsken William & Sons, 24, Dale Street, Liverpool. For American addresses write to American Trade Commissioner, 9-10. Esplanade Mansion, Calcutta.

3082 C.B., Calcutta—Cork-lined soda water bottle capsules may be had of Nath & Bros., 97, Ezra Street; Mukherjee & Sons, 3, Ezra Street and Essence & Bottle Supplying Agency, 14, Radha Bazar Street; all of Calcutta.

3083 H.L.R., Kalimpong—An article on candle manufacture appeared in May 1949 issue of Industry.

3084 K.M.G., Tiruvannamalai—Vermicelli making machines may be had of Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension, Calcutta.

3085 B.S., Jodhpur—Labels may be had of Bharat Laxmi Press, 92, Princess Street, Bombay; Mukherjee & Sons, 3, Ezra Street, Calcutta —1; R. G. Paul & Co., 110-2, Grey St., Calcutta.

3087 R.P.P., Patna—We have no book on film manufacture. There is a proposal for starting a factory at Bangalore for manufacturing raw films in India. We have no book on steel-foundry. For such a book you may enquire of Thacker Spink & Co. (1933). Ltd., 3, Esplanade East and Standard Literature Co., Ltd., 13-1, Old Court House Street; both of Calcutta.

3089 C.L.S., Baijnath—For fats of animals you may enquire of Calcutta Tallow Supplying Co., 19, Teretta Bazar Street, Calcutta and Indian Bristle & Lard Supply Co., 31, Tangra Road, Calcutta.

3090 B.S.G., Sholapur—For dairy appliance enquire of Edward Keventers Ltd., 11-3, Lindsay Street, Calcutta and Volkart Bros., 8, Netaji Subhas Road, Calcutta.

3094 B.O.I., Akola—It is not possible to publish list of cotton mills of India, you better consult Industry Year Book & Directory published from this office, price Rs. 15.

3095 K.A., Guntur—Following is a formula of envelope gum: Gum arabic 1 part, starch 1 part; sugar 4 parts; water sufficient to give the desired consistency. The gum arabic first dissolved in some water, the sugar added, then the starch after which the mixture is boiled for a few minutes in order to dissolve the starch after which it is thinned down to the desired consistency.

3098 N.C., Banaras—For typewriters you may write to Remington Rand Inc. 3, Council House Street, Calcutta; Underwood Typewriter Agency, 2, Mangoe Lane, Calcutta and Royal Typewriter Co., 9, Mission Row, Calcutta.

3102 H.D., Muttra—To harden vaseline you may mix beeswax with vaseline. In order to make tablets from powder add some water to the powder and make it a lump, dry in the sun and then break into small grains. These grains when put in the machine will produce tablets

3103 C.S.B., Mangalwarpeth — It is not possible to detect the contents of any indigenous medicine by chemical analysis.

3104 A.D.G., Delhi — There is no arrangement for imparting practical training in plastic and rubber balloon industries.

3106 K.R.K., Bombay—For fish hook making machine enquire of Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta. Fishing nets are mainly made by hand without using any machine. You may how ever use knitting machine. You may enquire of W. H. Brady & Co. Ltd., Mercantile Bldgs., Lall Bazar, Calcutta.

3107 J.J., Kenya Colony—Process of making mirrors will be found in Independent Careers for the Young published from this office, price Rs. 3. All the addresses you require may be found in Industry Year Book and Directory published from this office, price Rs. 15.

3110 K.R.K., Vizagapatam—Address of the All-India Board of Technical Studies in Commerce & Business Administration is not known.

3111 N.I., K.I., Jullundur city—Used blades are sharpened with glass sheets. These cannot be sharpened in a grinding wheel.

3112 H.G.A., Orai—Following is a recipe for scabies: Sublimed sulphur 1 part; benzoated lard 9 parts. Mix and use. Following is a formula of ringworm ointment: salicylic acid 320 grains; benzoic acid 480 grains; resorcin 240 grains; coconut oil 102; lanolin 1 lb. Mix intimately.

3113 M.A., Muzaffarnagar—For chemicals required by you enquire of Imperial Chemical Industries (India) Ltd., 18, Strand Road, Calcutta.

3114 L.B., Aijal—Oil is extracted from mustard oil seeds by means of indigenous ghanies that are driven by ox. There is no oil mill which is run by hand. For country ghanies enquire of Machinery Supplying Agency, 40, Strand Road, Calcutta.

3115 C.L.A., Jhansi City—We have no book dealing with optical goods business. Following is a list of optical goods dealers: Eastern Optical Co., 306, Bow Bazar Street; International Optical Co., 286, Bow Bazar Street, Calcutta and Optics Manufacturing House, 309, Bow Bazar St.; all of Calcutta. An exhaustive list will be found in Industry Year Book and Directory published from this office. You better advertise in newspapers desiring to open a branch at Jhansi.

3116 J.R., New Delhi—Wants to be put in touch with the suppliers of solapith for making hats. You may consult Paper Making published by All-India Village Industries Association, Maganwadi, Wardha, C.P.

3119 A.K.D., Nadia—An article on poultry farming appears elswhere in this issue. If you go through the article you will get all information required.

3124 N.C.M., Begunia — Biscuit making machines may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta. Indian Home Baker is not available at present.

3125 J.B., Kolhapur—You better write to the Editor of Popular Science for particular regarding 2 H.P. engine, because machine has not yet been put in the maket.

3126 J.S.M., Hathras—For vacuum packing machines enquire of Francis Klein & Co., Ltd., 1, Royal Exchange Place, Calcutta.

3129 J.K.D., Mokameh—Process of manufacturing liquid disinfectant and naphthanlene will be found in Manufacture of Disinfectants and Antiseptics published from this office, price Rs. 3-7 including postage. Follwoing is a formula of razor paste: The simplest formula is a mixture in equal parts of rouge and emery powder, rubbed up with spermaceti ointment. Coke is also used as a cutting agent. Suet, prepared lard in fact any greasy or soapy substance, will answer for the vehicle.

3132 M.R.S.P., Madras—It is not possible to dye charcoal to green colour.

3133 G.S.U., Khurja—Soda water making machines may be had of Essence and Bottle Supply Agency, 14, Radha Bazar Street, Calcutta.

3137 A.C.J., Rohtak—You may write direct to The Institute of Indian Standards for the formula of Ink.

3139 M.C., Neemuch Cantt:—Sandalwood oil is extracted from sandalwood by distilling process. Mentha piperita is largely grown in Japan, America, England, Italy, Germany, etc. The plants are propageted by roots planted out in the open fields on prepared ground in March and April. In the second year they yeild the best oil. The plants continue to thrive for about five years and are then replaced by new ones. The crop is collected towards the end of August or the beginning of September just before the bud opens. The plants are partially dried before being transferred to the distilling apparatus.

3140 B.S.P., Mysore—Lacquered tin sheets are not available in the market you have to lacquer the tin sheets yourself. For tin sheets enquire of Balmer Lawrie & Co., Ltd., 103, Netaji Subhas Road, Calcutta; for cork sheets enquire of Essence and Bottle Supply Agency, 14, Radha Bazar Street, Calcutta.

3141 R.N.B., Delhi—To enamel copper wire suitable for electrical purposes first prepare an insulating composition by melting 2 parts of asphalt together with 2/5 part sulphur and adding to this mixture 5 parts of linseed oil varnish. Next keep the temperature of the whole to 200°F for 6 hours. After this allow it to cool. When cold add oil of turpentine sufficient to make the mass as thin as syrup. Now stretch the oil on cleaned copper wire and apply this composition evenly by means of a brush or other suitable arrangements. When dry beautiful black lustrous elastic enamel produces over the wire. when transparent colourless enamel is required coat the copper wire with shellac varnish prepared with linseed oil containing a little castor oil: of course the varnish should be prepared with bleached shellac.

3142A. D.D., Calcutta—For books on latex goods you may enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta and W. Newman & Co. Ltd., 4, Old Court House Street Calcutta

3143 D.S.B., New Delhi—All the formulas you require will be found in Manufacutre of Toilet Goods published from this office, price Rs. 4-7 including postage.

3144 M.L.G.C., Delhi—Formulas and processes of manufacturing all sorts of ink will be found in Manufacture of Ink published from this office price Rs. 3-7 including postage.

3145 M.M.S., Jammu — Whereabout of School of Chemical Technology is not available.

3153 J.V., Jangaon—We have no book on dye manufaceure. For books on dye manufacture you may enquire of Thacker Spink &

Co. (1933), Ltd., 3, Esplanade East, Calcutta and W. Newman & Co. Ltd., 4, Old Court House Street, Calcutta. Process of manufacturing dyes will appear in Formula section in due course.

3154 R.K.A.C., Lucknow—Following is a formula of ink eradicator: Alum 2 lbs. citric acid 2 lbs. Mix thoroughly and dissolve in 5 lbs. of water.

3155 A.N.R., Bombay — Reply to your letter has already been sent by post.

3156 S.N.C., Moradabad—We have no book dealing with manufacture of German silver sheets. You may enquire to Thacker Spink & (1933), Ltd., 3, Esplanade East, Calcutta for the above book.

3157 A.H., Moradabad—A good formula of shaving cup soap appeared in November, 1948, issue of Industry.

3168 A.I., Calcutta—You have to use sheet metal working machines for manufacturing aluminium utensils. Sheet metal working machines may be had of Alfred Herbert (India), Ltd., 13-3, Strand Road, Calcutta and Francies Klein Co. Ltd., 1, Royal Exchange Place, Calcutta.

3169 N.N.B.C., Dhubri — For rope and shuttle making machines enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta. Bread making machines may be had of Small Machineries Manufacturing Co., 22, R. G. Kar Road, Calcutta.

3170 G.A., Calcutta—We are not aware of any such book.

3176 M.K.S.H.A.C., Madras — Address of S. A. Leonard Biermans is 13-1A, Government Place East, Calcutta. Playing cards may be had of United Playing Card Co., 81, Chukla Street, Bombay 3, and Indian Playing Card & Carton Manufacturing Co., Lashkar, Gwalior.

3177 M.L.G.C., Delhi — For glass bottles enquire of the following firms: Calcutta Glass & Sillicate Works, 9, Kundu Lane, Calcutta; Glass Producers Ltd., 56, Belgachia Road, Calcutta and Victoria Glass Works, 8, Lyons Range, Calcutta.

3178 C.S.A.C., Allahabad — For twine enquire of Calcutta Miscellany, 12, Ghose Lane, Calcutta and Chittaranjan Crochet Cotton Mfg. Co., 37, Ghose Lane, Calcutta.

3179 M.K.B., Sirsa—Following is a list of periodicals in Hindi: Lakmanya, 160, Harrison Road; Vishwamitra, 14-1A, Sambhu Chatterjee Street, and Visal Bharat, 120-2, Uppper Circular Road; all of Calcutta. Following is a list of radio institutes of Calcutta: Radio College, 191-1, Bowbazar Street; Eastern Institute of Technology, 58B, Rash Behari Avenue George Telegraph and Training Institute, 136, Bow Bazar Street and College of Wireless and Commerce, 212, Bow Bazar Street. It is not possible recharge exhausted dry cell.

3182 G.C., Amritsar — Following is formula of hair fixative: Distilled water 9[illegible] parts; glycerin 30 parts; borax powdered [illegible] parts. Mix and add tincture of benzoin 225 parts Allow to stand for 3 to 5 days. Filter, add perfume and bottle.

3184 V.D., Indore—In order to remove th[e] defect of the ink dilute by adding more wate[r].

3185 R.N., Nilgiris—We are not aware o[f] any such cement.

3186 R.J., Amraoti—For preparing kumkum take 1 part carmine and 10 parts dextrine mi[x] thoroughly and pack.

3187 C.P., Chikodi Road — Waste slat[e] stone can be powdered and utilised in manufacturing slate pencil. Slate tiles are sometimes used as roof tiles. Flux is a patent preparation of a British firm that keeps it secret. Moreover the process is still in experimental stage. Deodorised kerosene oil is known as white oi[l] which is used as cheap quality hair oil and i[n] adultrating vegetable oils.

3188 K.C., Kanpur—You have to register your company with the Registrar, Joint Stock Companies of your province. Your company will be public limited company as you intend to sell shares to public.

3189 G.H., Katni—For cinema machines you may enquire of Evergeen Pictures Corporation, 11, Esplanade East and French Universal Talkie Equipment, 36, Dharamtala Street, both of Calcutta.

3190 G.S., Kakinada — We have no such book. You may consult Industrial Chemistry by Martin. Following is a formula of gelatin capsule: Gelatin 4000 parts; glycerin 100 parts Mix and keep aside to dissolve. Next prepare in a separate vessel petroleum 0.02 part; benzine 0.04 parts. Then mix the two and form the capsules in a suitable mould. Capsules are kept in 3-5 per cent. formaldehyde solution. Gelatin is pure boneglue. Chinese blue is not water soluble. Depilatories of all sorts lose their efficacy if exposed for long time. Following is the process of preparing Chinese blue: Sulphate of iron 63 parts; yellow prussiate of potash 56 parts; sulphuric acid (conc.) 30 parts; bichromate of potash 8 parts. Dissolve the sulphate of iron in 100 parts of boiling water and also dissolve in a separate vessel the prussiate of potash in an equal quantity of boiling water. Mix the two solutions and boil for 1½ hours Now pour very slowly the acid and then add the crystals of bichromate of potash. Stir very gently for ten minutes, wash at once and repeat washing at least three times, filter, press and dry.

—REVIEW OF BOOKS

A PLEA FOR THE MIXED ECONOMY by M. R. Masani. Published by The National Information and Publications, Ltd., National House, 6, Tulloch Road, Apollo Bunder, Bombay. Pages 37, price Annas Twelve.

The author of this brief but well-written pamphlet decries the present craze for nationalisation and equitable distribution of the national income. He rightly suggests that in a very poor country like ours increased production is an immediate necessity and equitable distribution will have to wait till this necessity has been fulfilled perceptibly.

He quotes authorities to prove that nationalisation has not succeeded in placing Soviet Russian economy on an enviable footing as yet. Her economic achievements really do not compare favourably with those of the U.S.A., a country of free enterprise.

Most advocates of nationalization claim that it would eliminate high profits and make cheaper capital available to the State. They claim that nationalization would give an incentive to the workers and increase their efficiency. Mr. Masani examines these claims only to show how erroneous they are. He points out that in the transitional period India's industrial advance will depend in the main on the pace of imports of capital goods made available to us through loans from foreign countries or by investment of foreign capital in industrial enterprises here. If we indulge in any doctrinaire experimentation by ignoring the realities, we may have to forego the advantages of securing such credits or capital to our own detriment. The author does not think that nationalization would prove a sure guarantee against rifts between labour and the State or the former's inefficiency. Experience shows workers of nationalized factories on strike in some of the foreign countries have often turned down the argument that they are no longer serving private capitalists but the nation of which they are part and parcel.

The author's objection to full-scale nationalization, such as prevails in Russia, is basically sound in as much as it means both dictatorship and destitution. Russia's "economic democracy" is not compatible with real democracy which ought to be both political and economic.

After having shown up the defects of full-scale nationalization the author advocates for our country, the adoption of a system of mixed economy which will be both State and Free Enterprise dovetailed into the same economic order. The three sectors of this system as envisaged by the author, are : (1) A sector of existing industries which may be taken over by the State; (2) The second sector would be a large number of new enterprises to be undertaken by the State; and (3) The third sector should comprise private industries and this would be the largest. The Government may, if it thinks necessary, exercise a certain amount of control on the private enterprises. But in any case the scope of controls should not be inordinately large, as that would take away all incentives necessary for development.

SURVEY OF CURRENT INFLATIONARY AND DEFLATIONARY TENDENCIES. Issued by the U. N. Department of Economic Affairs. To be had of Oxford Book and Stationery Co. Scindia House, New Delhi. Pages, 88, price not mentioned.

This Report was issued by the U. N Department of Economic Affairs as far back as September, 1947 and so its contents certainly cannot be taken for an up-to-date study of the world economic conditions and trends. Even so, its utility hardly can be questioned, for the economic conditions of the world do not seem to have changed appreciably ever since the publication of the Report.

The Report studies the post-war economic and financial set-up in the following countries :—

(1) The U. S. A., where the question of possible recession in the near future is discussed ;

(2) The U. K., France, Italy, Poland, and Yugoslavia, where the various patterns of inflationary pressure in devasted Europe are considered ;

(3) India and Latin America, where inflation in under-developed countries is discussed and its implications for the problem of development are examined.

The above different countries have been chosen with a view to illustrating the problem in the world's various regions.

Dealing with the U. S. A. the Report warns that economy here is threatened with the menace of recession. There is not much truth in the popular belief that, should recession occur, it will be of a mild "corrective" nature. The Report points out that "a recession may have a seriously depressing effect on business investment in fixed capital which may be much less conditioned by urgent needs of post-war re-adjustment. Although the unsaturated demand for automobiles and houses will have a mitigating influence, large portions even of that demand may cease to be effective once the recession sets in. In that case, a serious depression instead of a mild recession may well be the result."

Dealing with the problem of inflationary pressure in devastated Europe the Report says that the requirements for savings are higher in relation to national income than before the war. But there is actually a tendency to save less than before the war for several reasons :- (1) Consumption per head, especially of necessities, is lower ; (2) there is a tendency to replenish consumers' stocks of durable and semi-durable goods, which were depleted during the war ; (3) the existence of a pent-up demand in terms of liquid savings accumulated during the war ; (4) on account of higher price

shooting up higher still the public's confidence in the value of money has been rudely shaken and this has created the tendency to avoid saving in money or securities and in consequence, there has been either increased consumption out of current income or hoarding of goods. The remedy lies in comprehensive controls and rationing. But most countries with the exception of Britain and Yugoslavia have gone on the principle of partial controls only. The Report believes that monetary returns and direct taxation may alleviate the inflationary tendencies to a great extent. Among devastated Europe's economic problems to-day the Report makes particular references to shortage of food, fuel and dollars.

Dealing with India and Latin America the Report says, "Any estimate of the course of events in India and Latin America in the near future must necessarily take into account the large-scale development schemes upon which these countries are likely to embark. Although a large part of the investment involved will be financed by balances of foreign exchange accumulated during the war, or by foreign loans, a substantial part will have to be financed at home. If direct taxation is not increased, inflation will follow just as it did during the war. However, even if development expenditures are offset by direct taxation, the problems of inflation in food prices will not be solved, because taxation of higher incomes will hardly reduce the demand for food. In the long run, an increase in food production will doubtless constitute a very important part in the development programme of under-developed countries. This will require fundamental social and technical changes in the agricultural economies. In the short run, however, the countries undertaking the development of their rsources will have to import not only machinery, but food as well."

The above quotation may well go down as an opinion of experts. In this connexion we would like to mention the determination of the Indian Government to make vigorous efforts to attain self-sufficiency in food by the end of 1951. It is said that India will not import food grains after 1951 except in cases of grave emergencies. But merely thinking or talking in terms of self-sufficiency will be of little help. The social and technical changes in agricultural economies necessary for the purpose should be considered and given effect to. Some of the chronic maladies of our agriculture are the fragmentation of holdings due to defective succession laws, absence of manures and fertilisers, primitive methods of cultivation, absence of irrigation facilities, the peasant's utter dependence on the money-lender, absentee landoridism, etc. The Governmnt should be prepared to root out as many of these defects as possible. Otherwise all the loud talk about food self-sufficiency will be reduced to mere wishful thinking.

NOTICES & REVIEW

(Manufacturers sending specimens samples of their products for notice and rev may please note that no notice is published medical preparations and allied substances this sections.)

COLOURED HANDKERCHIEF

We are glad to receive from St. Josep Institute Studio, 246/A, Great Cotton R Tuticorin one piece fast colour handkerel which is done by purely photograp process.

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TRADE ENQUIRIES

(To communicate with any party write him direct with name and address given be mentioning Industry).

3015 F. Ihl & Co.,—Kerawala Mansion, Floor, Carnac Road, Bombay-2.—Want to put in touch with reliable suppliers of he leave and powder, beeswax, gum karaya, g arabic and kamala powder.

3037 J. Ahmed, 73, Colootola Str Calcutta 1.—Wants to be put in touch with firms manufacturing candy, drops, gums, also interested in dealing with the nuts pack firms.

3074 H. L. Saha, Main Road, Lahard Ranchi—Wants to be put in touch with manufacturers of silver bangles at Delhi Banaras.

3164 Dr. M. M. Singh Rajan, 120, Rag nath Pura, Jammu—Wants to be put in tou with the suppliers of the oil of Psor Corilifolia.

3191 K. R. Senna, 4/47, Wigram Ro Rajahmundry—Wants to be put in touch w the suppliers of ebonite rods of diffe colour.

3254 Aziz A. Ghumra, Via Jamjodhp Dhrapha, Saurashtra—Wants to be put in tou with the agents of Bata Shoe Co.; Bharat Gl Works, Delhi; manufacturers of Zulfe—Ben hair oil and Sweet 17 Brilliantine and snow

3264 Ranjit Singh Pamani, 5. Har Mukherjee Road, Calcutta—Wants to be put touch with the suppliers of graphite electrod

3267 A. H. Shaikh, Khagaul, Patna Wants to put in touch with the manufactur of agarbatti in S. India.

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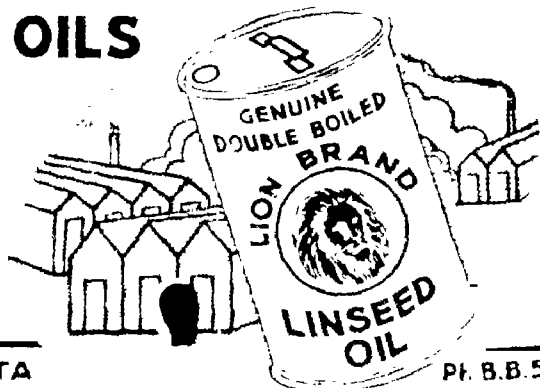
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He is the only Astrologer in India or even in the world who first predicted the Allies' Victory in the last world war on **3rd. Sept., 1939** within 4 hours the day of the declaration of war. This miraculous prophecy has earned for him praise and honour from His majesty King George VI, and Viceroy of India and the Governor of Bengal, similarly the wonderful prediction made by Panditji (Vide his Telegraph No. 19 of Hatkhola P. O. dated 3rd. Sept. 1946) about the future of Interim Govt. headed by our Great leader Pandit have already been proved correct.

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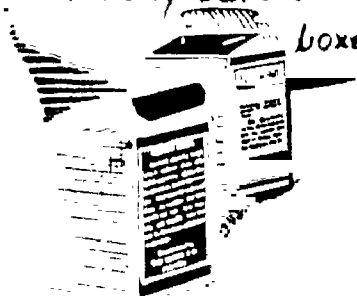
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BIRTH OF A NEW REPUBLIC

AFTER thousand years of foreign rule sodden with tearful recollections of frustration and incessant strifes breaks forth the 26th of January 1950 with messages of the birth of a great nation upon the stage of international politics—the Sovereign Democratic Republic of India.

The inauguration of the Republic is culmination of a long process of struggle for freedom, resistance against exploitation, and establishment of an inalienable right for economic development carried out with unflinching devotion by the whole nation under the leadership and guidance of a selfless band of political, economic and social workers.

The Indian Republic, now free from foreign political domination of every kind, can henceforward carry on quite unhampered the administration of the country in a way that best suits her traditions, culture and present requirements for the good of the millions of people who inhabit this land.

The Republic just born under happy auguries is blessed with a constitution that guarantees social, economic and political justice to all; safeguards liberty of thought, faith and worship; promotes equality of status and of opportunity; and assures dignity of the individual and unity of the nation. It is however undaunted will and tenacious purpose of the people that can give it a shape we all so desire.

The Republic is just on her legs: she has to show her mettle. The problems confronting the country are too numerous to be enumerated. Bharat is suffering to-day under scarcity of food, cloth, building materials and numerous articles of daily consumption, difficulties of transport bottleneck and the scourge of provincialism and class hatred. To forge ahead Bharat wants another band of honest men as in the days of struggle who will work out the destiny of the country without self-interest for the peace and happiness of 32 millions of people that make up the nation.

—THE CONSTITUTION OF INDIA:

ITS BEARING ON INDIAN INDUSTRIES.

THE Indian Constitution although, being a flexible federation is a dual polity aiming at having uniformity in all basic matters for the sake of the consolidation of the Union. A welcome feature of the Constitution is that in normal time it is designed to work as a federal system, but in times of war and other national emergencies, the whole country becomes converted into a single unitary State. It sets out the most elaborate declaration of human rights yet framed by any State, the fundamental rights enumerated in the Constitution falling under the following categories:—Right to equality; Right to freedom; Right against exploitation; Right to freedom of religion; Cultural and educational rights; Right to property; Right to constitutional remedies.

It thus appears that the Constitution safeguards that any Indian can pursue trades and industries without any discrimination whatsoever in any part of India. No State in like manner will enjoy preferences over other States. The relevant Clauses of the Constitution are given below for the information of our readers.

"301. Subject to the other provisions of this Part, trade, commerce and inter-course throughout the territory of India shall be free.

"302. Parliament may by law impose such restrictions on the freedom of trade, commerce and inter-course between one State and another or within any part of the territory of India as may be required in the public interest.

"303. (1) Notwithstanding anything in article 302, neither Parliament nor the Legislature of a State shall have power to make any law giving, or authorising the giving of any preference to one State over another, or making, or authorising the making of, any discrimination between one State and another, by virtue of any entry relating to trade and commerce in any of the Lists in the Seventh Schedule.

(2) Nothing in clause (1) shall prevent Parliament from making any law giving or, any preference or making, or authorising the making of, any discrimination if it is declared by such law that it is necessary to do so for the purpose of dealing with a situation arising from scarcity of goods in any parts of the territory of India.

"304. Notwithstanding anything in article 301 or articles 303, the Legislature of a State may by law—

(a) impose on goods imported from other States any tax to which similar goods manufactured or produced in that State are subject, so, however, as not to discriminate between goods so manufactured or produced; and

(b) impose such reasonable restrictions on the freedom of trade, commerce or inter-course with or within that State as may be required in the public interest:

Provided that no Bill or Amendment for the purpose of Clause (b) shall be introduced or moved in the Legislature of a State without the previous sanction of the President.

"305. Nothing in articles 301 and 303 shall affect the provisions of any existing law except in so far as the President may by order otherwise provide.

"306. Any State specified in the First Schedule which before the commencement of this Constitution was levying any tax or duty on the imports of goods into the State from other States or on the export of goods from the State to other States may, if an agreement in that behalf has been entered into between the Government of India and the Government of that State, continue to levy and collect such tax or duty subject to the terms of such agreement and for such period not exceeding ten years from the commencement of this Constitution as may be specified in the agreement; Provided that the President may at any time after the expiration of five years from such commencement terminate or modify any such agreement if, after consideration of the report of the Finance Commission constituted under Article 280, he thinks it necessary to do so.

Industry

EDITOR:
K. N. BANERJEE.

VOL. XL. CALCUTTA, FEBRUARY, 1950. No. 479.

PROBLEMS OF AGRICULTURE

THE ever present food scarcity has all along necessitated its imports from foreign countries involving a colossal expenditure of our limited reserves of foreign exchange. It seems, therefore, meet and proper that our Government have set themselves the task of achieving self-sufficiency in food within two years. Efforts are also being made to produce more Jute and Cotton.

When a drive for increased food production is being insisted upon, some think that we shall do well to mechanise cultivation and make an extensive use of modern methods. But there is a section of public opinion which rightly doubts the efficacy of banking on the so-called scientific methods of cultivation. Moreover tractors and other machineries are too costly for us to afford.

Speaking at the Agricultural Economic Conference recently held in Madras, Dr. Rajendra Prosad advised increased dependence on age-old indigenous methods and resources. He thinks that mechanised ploughing may confer some immediate advantages but the final results to be obtained therefrom may not be altogether favourable. Chemical fertilizers may lead to increased yields immediately, but in the long run their indiscriminate use will sap up the fertility of the soil. On the other hand, organic composts can be easily prepared from waste matters and their use is not detrimental to the fertility of the soil.

There is a scramble for collective farming these days. The idea is to remedy the evil of uneconomic cultivation by organizing a number of small fragmented holdings into one big farm. Dr. Prosad said that the same end could be served, even without running into expenses over new types of experimentation, by co-operation between the small holders sponsored by public workers and patronised by aids from the State.

The experience of countries which have resorted to mechanised cultivation shows that the soil can hardly withstand intensive cultivation by machines for any great length of time. On the other hand India's traditional plough-and-the-cattle method has stood the test of ages. If mechanization is introduced, many of our agricultural workers will lose their occupation.

—CURRENT TOPIC

37TH SCIENCE CONGRESS

The 37th session of the Indian Science Congress was held in Poona last month. The Congress was presided over by Prof. P. C. Mahalanobis and inaugurated by Dr. Syamaprosad Mookerjee, the Indian Minister for Industry and Supply. Prime Minister Nehru addressed the Congress on the opening day. The Congress was attended by over 5,000 delegates from all over India and twenty-two eminent scientists from the U. S. A., Britain, Sweden, France and Germany.

SCIENCE AND NATIONAL PROGRESS:—Pandit Nehru called for scientists' co-operation in the task of solving the primary economic problems of India in a scientific manner. He asked the politician and the scientist to work in close co-operation and deprecated the present tendency "to get entangled in the tangled webs of power politics." The age is such that the politician is bound to feel helpless if he fails to secure the advice and guidance from the scientist. Commenting on the lack of co-operation between the scientist and the politician Pandit Nehru said, "Whether we understand science or not we are now certainly very much conscious of the fact that modern world is dominated by science. To-day we want the scientist to help us in our job. But we do not like his suggestions and even begin to think he is interfering too much in other people's way of doing things. The politician neither follows the advice given to him by the scientist nor follows his own way."

The Prime Minister's estimate is more applicable to the state of things prevailing in India than anywhere else in the world. It is time that all Government Departments relating to economic development and other nation building activi[ties] were handed over to the charge of sci[en]tists. If we can do that, only then co[uld] we expect to rehabilitate our impoveri[sh]ed economy in a scientific manner. [As] long as our scientists are not given t[he] chance to direct the work of nation[al] development, the cult of science in th[e] country is bound to remain academic a[nd] society-shunning, nor do we think it ma[y] be possible in the circumstances to rais[e] our people's standard of living.

Apart from its utility in the practica[l] sense, the cult of science, properly pursued, can render a great service to the cause of peace by inculcating on its votaries a genuine international outlook. In his address to the Science Congress the Prime Minister did well in reminding the scientists of their noble mission to chase away mankind's narrowness of vision arising out of parochial patriotism and the pursuit of the extreme form of nationalism. Pre-war Japan and pre-war Germany were not far behind other progressive nations in the sphere of material progress. But still they proved a menace to civilization, because they could harness to their benefit, only the materialistic potentialities of science. They ignored its cultural and spiritual factors and science helped them only to conjure up a Frankstein which brought about their ruin. To-day when certain nations are vying with one another in the utilization of scientific knowledge for destructive purposes, it seems essential that scientists should spring forward and win mankind over the paths of sanity by removing their delusions and inculcating in the minds of all a proper "spirit of international outlook."

Describing the comparatively unimportant [illegible]

been relegated here the Prime Minister said that India was dominated by the outlook of the lawyer, the classical philosopher and, lately, of the businessmen. We would like to suggest in this connexion that the Government can and should extend encouragement to the scientist in all possible ways and thus enable him to come into his own. Private industry and trade too have got an important role to play in the matter. They can lend patronage to research work and invite assistance from scientists for the purpose of keying up commerce and production to a scientific level.

Dr. Mookerjee in his address to the Congress called upon the scientists to contribute their share to the task of national reconstruction. According to the Minister our countrymen lack the scientific attitude to life and its problem and this is responsible for the non-application of knowledge to the betterment of human beings or to the promotion of our agriculture and industry. While not disputing the truth of the statement, we would like to point out that the immediate need to-day is to remove illiteracy so widely prevalent in India. This is the first thing for us to do and it will be of little use to expatiate eloquently on the value of scientific education and outlook so long we have not been able to do the first thing first.

A POTENTIAL ASSET :—In his presidential address Prof. P. C. Mahalanobis referred to India's vast population as only a potential asset. There was nothing, he said, India could not accomplish, it she would find it possible to harness her living reservoir of manpower. But the point is, when she is going to do that and how. When India became free two years and a half ago, hopes ran high that our National Government would push ahead with proper speed and energy, the formulation as well as the implementation of our development projects. But to-day, we find to our great disappointment that no perceptible progress towards national development on a planned comprehensive basis has yet been made. Our vast manpower resource lies practically untapped and due to the temporary need for curtailment of expenditure those already in employ fear that a large number of them will be thrown out of their jobs one dull morning.

In the absence of planned development of our national economy, our agriculture and our industry, the so-called potential asset in the shape of a vast population is bound to be reduced to a living liability. Prof. Mahalanobis' address at the Science Congress betrays no ignorance of this fact. On the other hand he seems very much alive to it. He, therefore, laid all stress on the need to correlate production to population. This does not mean curtailment of the latter. This means, as it should, increase in production so that population shall not remain out of proportion to production.

THE ROLE OF STATISTICS:—Prof. Mahalanobis pointed out that technologists and scientists had a very important contribution to make towards national development. The role of statistics was, perhaps humbler but no less weighty. The Professor said that along with the efforts to increase food production, attempts must be made to improve the statistics of not only food production but of its consumption and distribution. He also stressed the need of compiling figures relating to the growth of population on an annual basis in preference to the hitherto-in-vogue decennial system of census.

Describing how statistics formed an integral part of the dynamics of national planning, Prof. Mahalanobis gave the following details:—

"Firstly, there is the preparation of plans at the technical level requiring the help and co-operation of workers in every branch of science and technology. Statistics is indispensable at this stage for the supply of basic information. Secondly, the individual plans have to be built into a general plan. Here also statistics is the common denominator and supplies the common binding medium for the whole. Similarly, when the plan is to be implemented, statistics can help by conducting continuous assessment of the results by keeping account of the input of money, effort and resources and measuring what was obtained in return."

Coming as they do from a well-known statistician of our country we can only hope these remarks will receive the Government's careful attention. It is encouraging to be told by Prof. Mahalanobis that during the last one year, were visible hopeful signs of progress in statistics in India. He has given a few concrete instances:—"A comprehensive report on the industrial census of 1946 was published in July, 1949. A national Income Committee was set up to review the position in this field and make such estimates as might be possible, and the Central Statistical unit was converted into the Central Statistical Organization in December, 1949."

SYNTHETIC FOODSTUFF

Some time ago Pandit Nehru told the Central Parliament that the results of research work in India for discovery of good and nutritious substitutes for different varieties of foodgrains had been encouraging. He added that synthetic rice had been produced on a laboratory scale from maize and that arrangements were being made to set up a pilot plant for large-scale production. The materials used being cheap and processing simple, Pandit Nehru thought the finished product would cost less than natural rice.

Shortly after the above announcement had been made more details relating to the production of synthetic rice in India were supplied by a P. T. I. message from Bangalore. In view of the wide interest of the subject we are reproducing the message below:—

"Synthetic rice which when cooked looks and tastes almost like natural rice, has been produced in the Food Technology Laboratory of the Government of India located in Mysore City.

"Dr. V. Subramanyam, who is in charge of the laboratory, explaining the process, said that synthetic rice had been prepared from maize, jowar and other millets by two methods. Among the grains so far tried, maize is the best adapted for the purpose and yields an attractive white product when fractionated starch is used. When the gluten is included, the product is somewhat yellow, but cooks to a pleasing pale yellow product. The nutritive value of the product is improved by incorporation of casein (five per cent.) and salt mixture (two per cent.) or only calcium as a soluble salt.

"Groundnut cake can be incorporated but the resulting product is somewhat brown. Synthetic vitamins can also be added. To eliminate the fibre, the whole grain is first steeped in water containing a minute quantity sulphur-dioxide for two to three days and then ground. The fibre is then eliminated by sieving. The portion passing through the sieve is allowed to settle and the bulk of the supernatant liquid decanted out.

"The residue is cooked to a pasty mass and pressed through perforated discs into strands. The strands are partially dried in an air oven at 45 degrees to 50 degrees, cut mechanically into small pieces

roughly corresponding to the size of a natural rice grain and finally dried. The raw grains obtained in this way are similar in appearance to natural rice grain. They can be cooked in the same way as rice and the cooked product has an attractive colour and a pleasing taste that appeals to rice consumers."

DEVELOPMENT PLANS

In the course of an address at the annual session of the Indian Chemical Society in Poona last month, Dr. J. N. Ray disclosed that the Government would start the manufacture of penicillin in India in collaboration with a foreign firm. He also gave the following details about the development plans now under consideration:

INDUSTRIAL EXPLOSIVES:—A British firm has surveyed the possibility of its manufacture here and the scheme is under the Government's consideration.

SYNTHETIC OIL FROM COAL:—An American firm commissioned by the Government in May 1948 submitted a survey report which is under consideration. India now consumes 180m gallons of motor spirit, 66,000 tons of kerosene, 30,000 tons of various Diesel oils, 53,000 tons of furnace oil a year, while her production is 15m gallons of motor spirit (natural), 4,000 tons kerosene and about 4,000 tons of various Diesel oils.

DYE-STUFFS:—The Government brought out some German specialists to report on the possibility of establishing a dyestuffs industry in the Damodar Valley area.

PHENOL:—An American firm is considering putting up a plant. At present only one firm produces phenol formaldehyde resin. There are about 40 firms producing plastic articles in India with an aggregate consumption capacity of 3,000 tons of plysurene and large quantities of other moulding powders.

PLYWOOD:—The establishment of plastic resins would meet the demands of the plywood industry's requirements of resins. Plans have been formulated for the production of urea at Sindhri. At present there are 45 firms producing nearly 80m sq. ft. of plywood for tea chests and about 20m sq. ft. for commercial plywood.

RAW FILMS:—Co-operation of the Swiss group has been sought for the production of raw films in India, the second largest producer of cinema films.

AMMONIUM SULPHATE:—There is a project for its manufacture at Sindhri. The connected load of the fertilizer factory is, as at present planned, about 45,000 kw. added to which there is a big demand for steam for process work. It was decided to generate 80,000 kw. at Sindhri with room for expansion to 200,000 kw., if need be. The various river valley schemes which are under planning will also need very large quantities of high tension insulators. A scheme for its production is now under consideration.

STEEL:—Closely connected with development of chemical industries, its immediate post-war requirement was placed at 3m tons in 1945 as against the then production capacity of 1.2m tons. Three international firms were subsequently entrusted to report on the possibility of reaching the target of 3m tons and their report is now under consideration.

CEMENT:—By 1950 India will be producing 3.5m tons of cement as against the present consumption of about 4m tons, which will go up by 2m tons within the next few years. The present installed capacity is 2.7m tons in 21 units.

PAPER:—The target of 200,000 tons would be reached by 1951.

LEATHER:—The production of certain types of suntans and finishing chemical

is engaging the Government's attention. India earned in the neighbourhood of Rs. 19 crores per annum through export of tanned hides and leather products.

RAYON:—One unit for the production of acetate rayon is under erection. Two others will go into production shortly.

RUBBER:—India produces about 18,000 tons of natural rubber and rubber processing factories estimatedly consume 20,000 to 22,000 tons. Various rubber chemicals worth Rs. 3 crores are imported every year and their manufacture should receive immediate attention.

STATE TRADING

In a memorandum to the State Trading Committee Mr. C. H. Bhabha, India's former Commerce Minister, expresses his opposition to the idea of the State entering into direct trading activities. He contends that incentive is the mainspring of success in business and an impersonal organization like a State undertaking can, at no stage, expect to bring into play the same degree of incentive, particularly in the sphere of international trade. That private enterprise is needed to develop India's commerce with the world is beyond dispute. But uncontrolled private enterprise may not always prove efficacious. Hence the Government's proper role seems the finding of a via media between free private trade and State trading. In our opinion the solution lies not in State trading as such nor in uncontrolled private enterprise, but in State control of private trading within certain judicious limits.

INDUSTRY PRIZE ARTICLE

As responses from competitors to our invitation for articles for 1949 Industry Prize Competition do not appear to be sufficiently encouraging, we have decided to extend the same Competition this year too.

The articles submitted for the 1949 Prize Competition will be carried forward for the 1950 Prize Competition and will be duly taken into consideration when awarding prizes. The above competitors however are permitted to submit fresh articles or additions by the time mentioned.

—THE ART OF LAUNDRY

OF late many youths of Bengal have undertaken laundry business as their occupation. But as they are not familiar with the technics of washing and dyeing they have at their disposal a number of washermen and they themselves merely act as middlemen or commission agents, which hardly fetches more than the bare necessities of life. Not only these youths are on this drawback but also the most of the washermen appointed by them do not know how the valuable silk and woollen goods can be properly cleaned without damaging the fabric. In order to run the business more profitably a laundry-keeper should be acquainted with various processes of washing, dyeing and removing stains both by indigenous and up-to-date scientific processes. It is hoped that by following carefully the directions given here some of the unemployed youths would be able to earn their livelihood in an honourable way.

PRELIMINARY OPERATIONS

It is absolutely essential, before commencing to wash garments, to look over and sort carefully according to particular variety of articles to be laundered, such as whites, prints, woollen, silk, etc. These are then marked with indelible ink in a suitable position for identification of ownership.

If there are any large holes in the garments they should be drawn together to prevent their becoming enlarged through the rubbing and friction of washing. If there are stains that require removing by the application of chemicals, these had better be attended to before the clothes are put to steep, as all chemicals must be thoroughly removed immediately after they are used, or they will act destructively on the fabric.

As the subject of removing stains from clothes had already been dealt with elaborately in our August, 1932 issue we need not enter into discussion here. Readers will be amply benefited on going through that article if they intend to take up this occupation.

All the coloured clothes, such as prints, etc. and also all woollens should be kept dry until everything is ready for the washing, as moisture would injure the woollen fabric, and in all probability soften the colour of the print. White clothes on the contrary, are much improved by steeping in cold water. This should be done during the preparation and at least one day before they are washed. The reason for this is that white calico and linen are far more difficult to cleanse than woollens or prints, as this softens the fabric, the starch, and the solid matter, as well as removes any proteins that would be coagulated by the action of hot water.

BOILING

After rubbing out of the steeping water, the clothes should be boiled, for purifying and improving the colour of the clothes. The first thing to be done is to shred enough soap into the boiler to form a slight lather on top of the water. Then quantity of washing soda or crude soda ash is put in. When the water is slightly warmed, the clothes are immersed in the water and as it comes to the boil it will tend to draw any coloration due to proteins or other colouring matter out of the clothes. When the water boils, let the clothes boil quickly for at least one hour. During this stage it is a good plan to stir and press the clothes down into the boiler with a stick. If there is plenty of water, the clothes can be easily moved about. When a large washing is being done, the

water in the boiler is apt to become yellowish in colour. It should then be replaced by clean water. This is important, as it is impossible to make clothes white by boiling them in dirty or discoloured water. This is an obvious point that is generally overlooked by most washermen. When boiling fine articles, a little borax added to the water in the boiler helps to produce a surface gloss, and greatly improves their appearance when ironed.

RINSING

The rinsing of clothes after boiling is also very important factor, if they are to be kept a good colour. The clothes may be perfectly washed and well boiled, but if the rinsing is not thorough the soapy water remaining in them will certainly make them yellow. Lift the clothes out of the boiler and holding its one end suffle on a piece of wooden board in the manner of a washerman. This dislodges the soap and the loosened dirt. After this the clothes are washed in plenty of water and pass through the subsequent stages of washing.

BLUEING

This is especially done to improve the colour of white clothes, and to counteract the yellowish tint given to clothes by wearing and washing. Blues vary so in quality and in solubility that it is quite impossible to give a rule of definite amounts, but practice will soon teach the worker how much to use. As a suggestion, use about one teaspoonful of prepared liquid blue to two gallons of cold water.

In the process of making blue-water, the water should be well stirred each time the colour is added, so that the whole tubful may be of even colour. Test the colour by holding the hand about two inches under the water to see the degree of colour, or by blueing a small garment. Blue-water should not be too deep in colour, and should be lighter for thin garments than for heavy ones.

The clothes should be opened well before being put into the blue-water so that they will not be streaked with blue. Stir the water just before dipping the clothes, because some blue may have settled to the bottom and will streak the garments. The clothes, if quite yellow, may remain a few minutes in the blue-water; otherwise one or two dippings will be enough.

STARCHING

The clothes that require stiffening must now be treated with starch. The first part of the work is to prepare a suitable quantity of boiling-water starch, the amount of starch treated with boiling water should be according to the following recipe:—

Rice starch	1	tablespoonful.
Cold water	3	„ „
White wax or tallow		a small piece.
Borax	1	teaspoonful.
Boiling water		q.s

Mix the starch and cold water in a clean basin until the starch is quite smooth, remembering that boiling water does not break up lumps; add the wax, and put the borax into a small basin or cup, pour a table-spoonful or two of boiling water until it becomes semi-transparent, stirring while the water is being added. Add the borax carefully keeping back any sediment. Boiling-water starch is in the form of a jelly; and this when allowed to stand becomes thick and solid as it cools. At this stage it is useless for stiffening clothes, and to prevent it solidifying, not less than half a pint of cold water must be added and well stirred. This usually keeps it in a liquid state, and if it is not to be used, it should be covered until it cools.

Now divide the starch into portions, and dilute one portion by mixing it with 4 times its bulk of water, which is a suitable stiffness for table-linen. Make all the starch pale-blue. The clothes to be starched should be separated according to the stiffness required for different articles. Those that require slight stiffening, such as table-linen and under-linen, should be dipped into the diluted starch: and those that require excessive stiffness should be immersed into thick starch. As most muslin dresses and under-wears are worn soft and clinging, it is advisable to stiffen them in dilute starch, the consistency of which must be determined by the quality of the material and the kind of fabric of which they are made. The clothes after starching should be wrung tightly, either by hand or machine, and put to dry.

DRYING

There are two ways of drying clothes, out-of-door and in-door drying. The former is much to be preferred, especially for white clothes, as the fresh air acts as a purifying and whitening agent, and greatly improves the colour of the clothes. In this country the clothes are allowed to dry on hedges. The clothes in this case are straightened over the hedge, and left until they are dry. This is, of course, a very good method of drying clothes in calm weather, but when a strong wind is blowing it either batters the clothes so tightly into the thorns of the bush that they become torn, or they are blown into the ground and become soiled.

Drying clothes by straightening them on the grass is also another method generally practised by our washermen, but this is not very successful unless in bright sun shiny weather, when they can be dried quickly. In dull weather the drying is prolonged and the clothes become soiled with dust and in many cases require re-washing. Hence the best way is to dry the clothes by hanging. When clothes are hung out to dry, one rule should if possible be observed, viz., to hang them in the position in which they are worn. Garments such as shirts, coats, etc. should be hung by the shoulders; if the day is windy it prevents strain on the under-arm part, which is apt to tear if the sleeves are reversed. But on a still day, when drying is slow, garments may be hung by the hem in form of a bag, and thus hasten the drying process. Garments worn from the waist should at first be hung by the hands; this allows the water to drain from the thicker parts, and it also keeps them in better shape.

Square articles, such as table-cloths and sheets, should be hung 5 or 6 inches over the line and selvedges prependicular. If the line is high enough to prevent the cloth touching the ground, it may be left single, when it will dry more quickly. But to prevent its getting soiled it is sometimes necessary to bring up the lower corners and fasten them so as to form the cloth into a bag shape.

In rainy season when it is not possible to expose clothes to dry in open air hot drying-closets might be advantageously employed. Its construction is such that it can produce a current of hot air, which will continually pass over the clothes to be dried. By this apparatus with least difficulty one can dry the clothes within a very short period.

DAMPING

After drying, and before clothes can be made smooth by pressure or heat, they must be evenly damped. For this purpose water is sprinkled over the clothes either by hand or by mechanical spraying. But in most works damping is performed by hand. Here the fingers are dipped in a basin of clean water and the water shaken in small drops from fingers. The clothes

should be frequently turned and the sprinkling repeated until the dampness penetrates the fabric slightly when they are ready for folding. If clothes are made too wet, they receive no gloss. Damping before ironing must be done more thoroughly, as the hot iron dries the fabric, and at the same time gives an evener gloss than when the fabric is only slightly damp. The clothes for ironing should be folded and rolled up evenly, put into a basket, and covered to keep them free from dust.

FOLDING

Care should be taken to fold the clothes as it depends much on the folding because a garment carefully folded will wrinkle less; moreover, good folds may do much towards shaping. Fold the garment by laying it first on the table and then into its particular fold.

To fold a shirt care must be taken to keep all the starched parts together, and to prevent them staining the unstarched material. Take the shirt by the shoulders, and place it on the table front upper most, straighten the cuffs, one over each side of the front, and fold the neck-band over on to the front, then double the shirt in over again, forming a narrower strip, turn up the bottom hem a few inches, and roll from the top downwards. Leave for an hour or two before ironing, as the starch grains become softer and yield more readily to the influence of heat, and, when ironing, a better result is obtained.

IRONING

Certain rule will help the ironer, but ironing is an art and the best results will come only from the practice of frequent doing. All embroideries and laces should be ironed on the wrong side with a soft pad underneath, so the pattern may sink into the paid and not be flattened by the iron. Tucks should be pulled straight and ironed lengthwise, and at the same time downward from the upper part of the top tuck with bottom tuck. Iron and dry each part before beginning a new part. Goods left half dry or half ironed will pucker and look rough dry when finished. Ruffies should be ironed by ironing straight on the hem edge, and then by ironing up into the gathers. "Nose" the iron well between the gathers. Sleeves, ruffles, in fact all parts of the garment that may be ironed and allowed to hang over the board, should be done first.

All hems, tucks, and bands require extra pressing, as they are thick. Use heavy irons for heavy bedding and table linen, and light, more pointed irons for body cloths. The irons should be smooth and very clean and sufficiently hot to "hiss" when touched with the moistened finger. An iron is too cool when the moisture on the finger does not turn instantly into stream, but may be seen to bubble on the iron. On the other hand, an iron that is too hot will cause the moisture to evaporate so instantly there will be scarcely a sound. Beware of this kind, as it will cause scorch, which of course is injurious to the fabric.

COLOURED CLOTHES

Although a great number of different articles may be included under this heading, the principles for washing and finishing them are all very similar. The washing of these coloured garments, however, presents a double problem, for we have to consider not only the nature of the fabric, but also the colour of the garment. The wisest plan is to follow carefully the directions given below:—

The simplest way of cleaning printed goods is to wash them quickly in tepid soap-lather, which is free from traces of alkali. This removes the dirt with as

little rubbing as possible, although most cotton materials require some rubbing, especially when very much solied. If the colour seems especially sensitive, avoid all soaking and as much rubbing as possible. After washing, rinse thoroughly in plenty of cold water, putting a small quantity of salt in it, and then tightly wring to remove as much water as possible.

As soon as this is finished the garment should be wrong side out, and the starching should be done as for white clothes, keeping like colours together. It must then be wrung and hung up in shade to dry and not in the sun as in the latter case the colour is likely to fade away. When the clothes are dry, do not sprinkle water on them and roll like white goods but at once pass a fairly hot iron over them after covering their surface with a piece of cloth.

Where the colour seems uncertain, soap may be eliminated entirely from the cleaning, thereby eliminating all risk of the colour being affected by alkali. If water can be used at all, substitutes such as bran water, or starch water may be only process that will protect the colour.

WOOLLEN CLOTHES

In discussing the question of woollen goods, there are quite a number of important points to be considered. A well-washed flannel is much appreciated, and many people realise how much longer is the life of the garment when it is well washed.

It is wise to commence with white and light-coloured flannel or woollen goods. Prepare a bath of water at a temperature of not more than 110°F add to this sufficient boiled soap prepared by boiling 2 lbs. of soap in pieces with 2 gallons of water. For successful flannel-washing the water must show a good lather. The water is of no use, and will do more harm than good, if it has only a milky appearance. The rinsing water should be of the same temperature as that used for washing, but should have no soap added.

If no thermometer is available, the hand can be used as a test. When it is put right down into the bath there should be a slight sensation of tingling; otherwise the water is too hot. If there are a number of flannels to be washed, two waters should be prepared, one for first washing and the other for second and final washing. Flannels should be right side out when put into the water.

Commence with a light squeezing motion, relying upon the lather in the water, together with the gentle friction, to remove the dirt. As a broad rule, raw soap should not be rubbed on flannel or woollen garments, but, should the neck or wristbands be extremely dirty, it may be resorted it.

When the right side has been rubbed loosely and lightly all over, turn the garment and treat the wrong side in the same way. Friction applied with a fairly soft brush is not harmful to neck bands, etc., if they will not easily come clean. A number of garments may not be put into the water at one time. The washing of one should, be completed, it should be rinsed and hung to dry, before the next article is washed. Flannels should never be allowed to lie about after being washed, since they shrink, harden and darken in colour if not immediately hung to dry.

Ironing of woollens is more like pressing than like regular ironing. As the fibre scorches so easily, and the heavy seams. glaze under the pressure of iron. it is advisable always to cover it with a piece of damp cloth just before ironing. A garment half-dry when ready to be ironed will give better results. Should any gloss appear from ironing, rub it with a damp cloth and do not iron again.

In cleaning coloured woollen goods observe all points stated for white woollens and note one additional problem the fading or bleeding of colours. Dark coloured serges, gabardines, or broadcloths may be washed without risk of losing colours by using soap bark instead of soap, and always using cooler water than usually used for laundering. A recipe for soap bark follows:—

Soap bark	4 cups.
Water	1 gallon.

Cook for 20 minutes, and strain.

SILK CLOTHES

Silk, like wool, is an animal fibre. It does not shrink like wool but it is easily damaged by friction, heat, and strong alkalies. It is less strong when wet than when dry; therefore it may be weakened by careless washing. It scorches readily, consequently cannot be subject to extreme heat either of wash water or of iron. Moreover a hot iron stiffens and cracks silk. Alkalies will eventually dissolve the fibre, so these should be entirely eliminated in washing silk goods.

In cleaning silk it is not advisable to use water more than 110°F. First take the water in a suitable vessel at the required temperature. Add soap flakes or soap solution to make good suds. Cleanse the garment by dipping and pressing but not squeezing. If the garment is very soiled wash it in a second suds, then rinse thoroughly. White silks may be slightly blued. Squeeze dry; do not twist or wring silk fabrics. It not only weakens the fabric, but makes creases which will be hard to remove without a hot iron. Hang carefully, or, for special care, roll in absorbent cloths to dry.

If the silk garments are coloured, then additional care must be taken in washing. Reduce the temperature if necessary to prevent bleeding, and wash and dry quickly. In washing dark coloured silks the best results will probably be obtained by substituting soap bark for soap. If the silk needs a little redressing, use gum arabic in the last rinse water. This often prevents a thin silk from appearing washed-out and sleazy. Roll the garment in a cloth, and iron before it is entirely dry. A recipe for preparing gum solution follows:—

Powdered gum arabic	2 teaspoonful.
Warm water	1 quart.

Mix water with gum arabic as with flour. Let stand until all is dissolved Strain and use as starch water.

IRONING SILK CLOTHES

Since silk scorches easily, and heat converts white silk to yellow colour, use an iron that is not too hot. The garment should be ironed on the wrong side, and should be protected by covering it with a piece of cloth. If it has been carefully hung it will not shrink that require such a hot iron. Silk half dry is likely to iron with spots. A silk too wet and ironed with a hot iron will be stiff or papery.

INDIGENOUS PROCESS OF WASHING SILK & WOOLLEN GOODS

Particular care is required in washing silken, woollen cloth stuff, or clothes bearing an embroidery work of woollen or silken threads. In absence of proper care the colour will diffuse, and even where the cloth does not afford scope to the colour to get diffused, it would certainly lose its durability and softness.

Nothing better than soap-nuts (aritha) can be recommended for washing such stuff.

From very old times they are being used for this purpose. They remove the dirt without causing the slightest injury to the silk or wool fibres. Now-a-days a soap called the neutral soap can be had in the market. In case this soap be found to be

of a good quality, it can be used as a substitute for soap-nuts.

Either of these things should first be placed in boiling water and the water be thoroughly shaken till there is a thorough mixture. In case soap-nuts are used they should be taken out after the soap has mixed with water. Next cold water should be poured in this boiling water till it becomes thoroughly cold. Care must be taken that no heat is left in the water.

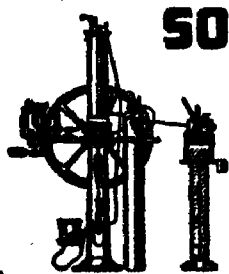
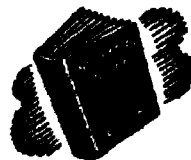
Dip into this cold water the cloth to be washed and shake it thoroughly from all sides for five to seven minutes. Then take it out and remove the water from it by pressing and not squeezing. After this pass the cloth through clean water. In case dirt is yet found lingering, the process can be repeated, but in no case should the cloth be kept in the water for more than five to seven minutes, and at every repetition of the process the cloth should pass through clean water before it is dipped into the mixture of soap or soap-nuts. It is advisable to do the final process in a large quantity possible.

In case the ironing of the cloth is to be done at home, it should not be done if the cloth is completely dry. Water should be sprinkled over it by hand before the iron is applied.

DRY CLEANING

The term dry cleaning is used when the cleaning is done entirely without water, but usually with petrol or benzine, which are grease solvents and clean by setting free the dirt in the fabric. The object of dry cleaning is to clean by a process which is rapid, which produces no shrinkage, no change of colour, no risk from colours "running" etc.

There are two methods in cleaning with volatile solvents, namely (1) by applying with a soft brush and (2) by totally immersing the goods in the liquid. In employing the first process the garment is spread on a table and is rubbed with a brush to remove the dirt and dust from its surface. Then taking a quantity of petrol in a suitable vessel moisten the brush over and over again in it and rub the cloth until the dirt and dust are totally removed. In this way if a portion of clothes becomes dirty, it may be cleaned in a few minutes. But collar, cuffs, sleeves, etc. can be easily and conveniently cleaned with a special type of brush named "Mutax."

When it is found convenient to wash the goods by totally immersing in the liquid, the lining of the clothes must be removed first before they are dipped in the petrol. These are then rubbed well so as to dissolve out the dirt and dust and expose to the sun to dry. After applying the iron replace the lining. In this manner neckties, pullovers, mufflers, etc. are cleaned and washed.

—TINNING OF COPPER AND ITS ALLOYS

THE art of coating metals with tin by dipping them into the molten metal is of considerable antiquity, and it is still the most widely used method of tinning. Until recently there was no satisfactory alternative tinning process, but within the last two decades there have been considerable advances in the art of electrodepositing tin. Still the old process is extensively employed throughout the world.

As the operation of tinning copper and its alloys require several steps to obtain the good coating of tin, a detail description of the process is absolutely necessary. With this end in view we are dealing with the subject step by step.

PREPARATION

Degreasing is not so often required with copper as with steel, since copper does not need to be protected with grease during storage. When, however, the articles to be tinned are greasy or oily, they may easily be cleaned in a solvent degreasing plant or by means of an alkaline cleaner. The complications described in connection with the degreasing of steel are not met with when dealing with copper.

Most copper is pickled before it is cold-rolled or cold-drawn, and any annealing which follows these operations is done in a bright-annealing plant. The tinner does not, therefore, have to deal with copper covered with a thick oxide scale. It is generally bright and clean, and the surface is only slightly tarnished due to the presence of a thin film of oxide. A convenient dipping bath is a cold solution of nitric acid containing 15 per cent. by volume of the concentrated acid. An alternative solution contains 10 per cent. of sulphuric acid and 2 per cent. of nitric acid, and is used hot. With both these baths the time of dipping is about 2 to 5 minutes. The more concentrated dips often used by platers (e.g. nitric acid 7.5 per cent., sulphuric acid 43.3 per cent., hydrochloric acid 0.2 per cent., and water 49 per cent. by volume) are also suitable and require only a few seconds, but they are not so frequently used. Some copper may be tinned quite well without acid dipping, but it is risky to omit this part of the process, and there is not much saving in time or cost by doing so.

THE TINNING OPERATION

After dipping in acid, the articles are washed in water and immersed in a flux solution, which is prepared as follows:—

Fluxes are used in hot-tinning in two different ways. A solution of a flux in water is used for dipping articles before they are immersed in the molten tin, and a layer of molten flux is generally used as a cover for the tin bath, in order to keep its surface free from oxidation.

The flux generally used as a preliminary dip is an aqueous solution of zinc chloride. As the article, wet with flux, is immersed in the tin bath, the surplus water boils off and the zinc chloride melts. The molten salt reacts with the surface of the metal being tinned, and removes films of oxide so that it is perfectly clean at the moment when it comes into contact with the tin. It is generally considered that the action of the zinc chloride is due to the liberation of a little hydrochloric acid, formed by interaction of the chloride with the water remaining in it. The flux also prevents spitting of the tin when the wet articles are immersed in it; the solution froths when it comes into contact with the molten tin, and the evolution of steam is much less violent than with plain water.

A suitable flux for general purposes is a solution containing 3 lb. zinc chloride and 5 oz. ammonium chloride per gallon. Zinc chloride may be purchased as a solid and dissolved in water, but is often made up as "killed spirit" by dissolving metallic zinc in commercial hydrochloric acid. The zinc is added to the cold acid until no more is dissolved, and the solution is allowed to stand over-night in contact with more zinc; it is then decanted off or strained, and ammonium chloride added in the proportion of 5 oz. per gallon. An earthenware or glass vessel is used to contain the flux during preparation and use, since in an iron tank the flux becomes contaminated with iron.

The flux used as a covering layer on the top of the tinning bath is of the same type as that used as a preliminary dip. It is most convenient to employ the flux in solid form (zinc chloride with 10 per cent. of ammonium chloride) for this purpose, allowing it to melt before tinning is commenced. It is also possible to use the solution by pouring it on carefully and allowing the water to boil off, but this is not recommended, since it pollutes the atmosphere of the tinning shop with acid fumes and a fine spray of flux. They are then transferred to the tin bath.

Copper reacts much more rapidly with molten tin than does or steel, and this necessitates certain modifications in the tinning operation. A layer of intermetallic compounds is formed on the surface of the copper when it is immersed in the bath, but, in contrast to the tin-iron compound, this layer increases in thickness quite rapidly. Pieces are continually breaking away and so facilitating the access of fresh tin to the surface of the copper. The pieces which break away dissolve in the bath cause it to become contaminated. In quite a short time a piece of copper may be completely dissolved in the tin bath at ordinary tinning temperatures.

On account of the reaction between copper and tin, the tinning bath and the coating produced from it gradually become richer in copper, and this eventually causes the coatings to be rough. The most important rules in the tinning of copper are therefore to keep the temperature of the bath as low as possible and the time of dipping as short as possible. A good tinning temperature from the point of view of minimising copper contamination is 250°C. (480°F), but for many purposes a somewhat higher temperature, 270°-280°C. (520-545°F), must be used in order to allow time for adequate draining of the surplus tin before solidification of the coating.

Generally only one tin pot is employed for copper, since if two are used the extended time of dipping produces more compound and makes the process uneconomical. The tin is not covered with a thick layer of flux, since the small amount carried over on the articles is sufficient to keep the surface reasonably free from dross. This flux is skimmed aside occasionally, and provided that the articles are withdrawn with a slight jerk trouble is not usually encountered from adherence of flux sports to them.

When very heavy articles are to be tinned, they require a relatively high tinning temperature or a large bulk of tin, in order to avoid undue chilling of the bath as they are immersed. This difficulty may be overcome if the articles are pre-heated to about the melting point of tin before they are dipped. They are pickled as usual, washed, and dipped in flux before heating. The flux keeps the surface of the copper clean, and the latter must have been thoroughly degreased so that a uniform film of flux will remain on it. The temperature of pre

heating is not critical, and it may be judged by observing the flux. Using the zinc chloride-amm ..ium chloride mixture recommended, a suitable temperature is that at which the flux layer, after first drying, begins to melt. A short immersion in the tin bath at a moderate temperature is then sufficient.

REMOVAL OF SURPLUS TIN

Since copper reacts so readily with molten tin, the liquid coating on the articles as removed from the tin bath contains an appreciable percentage of copper. The actual amount depends upon the copper content of the bath and the time and temperature of dipping. If it is more than 0.75 per cent, the copper comes out of solution in the form of particles of the tin-copper compound Cu_6Sn_5 as the coating cools. This makes the tin somewhat pasty, to an extent depending upon the amount of copper present, and hinders tht draining of the surplus tin from the tinned articles. For this reason, it is often necessary to assist the draining by wiping although small articles dipped quickly at a moderate temperature may generally be drained sufficiently by shaking. The use of a high tinning temperature to facilitate draining is undesirable, since it causes increased copper contamination of the bath and coatings, and after a short period of working the tin tends to become less fluid than it would have been with a lower working temperature. This is more fully dealt with in the following section.

Wiping is commonly carried out with pads of rag or tow, although special arrangements are sometimes adopted for articles of difficult shapes. For example, the insides of tubes are often wiped by means of a plug of suitable size, which is either pushed through by means of a rod or blown through with compressed air or superheated steam.

Articles which retain their heat fo[r] sufficient time after removal from the ba[th] may be wiped without any additio[nal] heating. The wiping should be comple[ted] while the coating is still quite fluid, [so] that the tin can redistribute itself over [the] surface and cover up the wiping ma[rks] to a large extent. If this is not possi[ble] owing to the rapid cooling of the arti[cle] the latter is kept hot by the careful [use] of gas flame while the wiping is co[m]pleted to give a good smooth surfa[ce]. During this operation, the temperat[ure] should not exceed about 280°C. (545·[F]) or the tin becomes yellow due to oxi[da]tion, and the wiping pad is burnt into [the] surface, giving a dirty finish. Since te[m]peratures during wiping can be estima[ted] only by inspection, a high degree of s[kill] and experience on the part of the tin[ner] is necessary. Wiping must also be c[ar]ried out expeditiously, in order to av[oid] undue compound formation and con[se]quent roughness of the coating. It [is] better to employ supplementary heat during wiping than to run the tin bath [at] a higher temperature, since the la[tter] method shortens the period during wh[ich] the bath may be worked before [it] needs treatment to remove excess [of] copper.

The wiping to which tin coatings [on] copper are generally subjected causes [the] problem of dewetting to be of less impo[rt]ance than in the case of coatings on st[eel]. During the process of wiping any [un]evenness caused by de-wetting is eli[mi]nated and a good finish is obtained. [If] wiping is not carried out, de-wetting [is] rather more liable to occur on copper th[an] on steel, and has been shown to be co[n]nected with the presence of particles [of] the copper-cuprous oxide eutectic in [the] surface. Grades of copper which are p[ar]ticularly low in oxygen therefore give u[ni]form coatings more readily.

CONTAMINATION OF TINNING BATHS BY COPPER

When a tinning bath is used for copper, the copper content tends to become steadily higher, for the reasons already mentioned. This increase is partially offset by the routine addition of new tin to the bath, and in some cases, where a low dipping temperature can be employed, this serves to keep the copper content within satisfactory limits. More often, however, trouble is eventually experienced due to the presence of excessive quantities of copper in the bath. This is indicated by the coatings becoming pasty and gritty almost immediately after removal of the tinned articles from the bath, and they cannot therefore be drained or wiped satisfactorily to give a smooth finish. The bath itself may also become pasty around the edges, due to incipient solidification.

REMOVAL OF COPPER FROM TINNING BATHS

The purification of the tin bath is effected by cooling it and then removing the sludge of tincopper compound which separates out. Fortunately the compound is relatively dense, so that it sinks readily to the bottom and is not difficult to remove. It is usually disposed of to a firm of smelters, since few tinning shops are equipped to treat it or utilise it economically.

In removing copper in the form of compound, a good deal of tin is inevitably removed as well, since the copper is chemically combined with approximately twice its weight of tin. It is for this reason that it is uneconomical to increase the bath temperature when its copper content increases. The higher the temperature the more compound is formed and this means a definite loss, as the price that can be obtained for it is less than the value of the tin it contains.

The practical procedure for carrying out the separation depends largely upon the size and shape of the bath. With a wide, flat-bottomed bath the following method is found satisfactory. The temperature is gradually reduced to about 235°C. (455°F) and as the compound separates out round the edges and at the bottom, it is scraped to one end of the bath. If the latter can be slightly tilted this is an advantage, and in this case the compound is accumulated at the higher end. The heap of compound may be kept at this end by inserting a steel plate into the bath to act as a dam. Liquid tin is then ladled out carefully from near the surface at the other end of the bath, and is cast into ingots. When sufficient of this pure tin has been withdrawn, the compound is scraped out with a perforated ladle, which allows liquid tin to run back into the bath. The ingots of relatively pure tin are then returned to the bath, and sufficient new tin is added to bring the bath to the normal level. In a narrow deep pot the compound is allowed to settle at 235°C. (455°F) as before, but it is necessary to ladle out most of the pure tin before the compound can be scraped out efficiently from the bottom.

—RUBBER ADHESIVES IN INDUSTI

IT is not known who first discovered that crude rubber could be dissolved in benzole or naphtha, making a viscous sticky solution which could be used as an adhesive, but records show that such rubber solutions were prepared when rubber was first used industrially in this country although their use was confined to the rubber industry mainly for two functions, viz.: (a) for spreading on cloth in order to waterproof it, and (b) for making joints during the manufacture of rubber articles.

The public first became aware of the properties of rubber solutions when pneumatic tyres were invented for bicycles and the punctures—which as that time were remarkably frequent—were mended by sticking a rubber patch over the puncture, using rubber solution.

In contrast to this, at the present time rubber adhesives of many types, amongst which are simple rubber solutions resembling very closely those original crude solutions, are used in many varied industries as well as by the general public, for purposes often quite unconnected with rubber articles or components.

The following description given by Mr. L. E. Puddefoot in Rubber Developments issued by British Rubber Development Board will be helpful to our readers.

PROPERTIES OF RUBBER ADHESIV

The repair of a tyre illustrates unique properties which make a rul adhesive so useful. The procedure t —viz., to apply to the surface of the t and of the patch, after both have b cleaned, a thin film of rubber solut allowing this to dry by evaporation solvent and pressing the two dry fi together, when they adhere immediat and tenaciously—could only be used w a rubber solution because the film de sited from a rubber solution has "c tack". This means that two fresh fi surfaces of rubber, as deposited by rubber solution, will adhere one to t other when quite dry and free from so vent. The film must be fresh as the "d tack" property becomes progressively r duced as the film ages in contact with t air due partly to oxidation of the surfa and partly to the deposition of a du layer. If the surface is protected fro contact with the air by an impervio textile backing, as is usually the ca now-a-days with prepared tyre repa patches, the "dry tack" is maintaine until the protective backing is remove This "dry-tack", at normal temperatu is a phenomenon confined entirely t natural rubber.

Another property of rubber adhesive

TABLE I.

Relative Tack of Natural Rubber and Synthetic Rubber Based on Butadiene.

Filter	Natural		Synthetic	
	None	Carbon black.	None	Carbon black.
Relative Tack	1.0	0.8	0.2	0.2

illustrated by the repair of tyres is that the joints have elasticity, that is, extensibility and recovery. When the joint is bent or stretched the rubber adhesive film bends and stretches with it and when it comes back to its original size and shape the rubber adhesive film recovers also without any tendency for the joint to be broken.

To these important properties of

"dry tack" and elasticity may be added virtue of resilience, which enables the adhesive to resist impact and vibration, and water resistance. There are many other adhesives, such as bone and fish glues and nitro-cellulose synthetic resins of the Bakelite type or ureaformaldehyde glues, which have much higher tensile strength than rubber adhesives but none of them combines elasticity, resilience and water resistance as does a rubber adhesive; also none of them has "dry tack". The importance of "dry tack" is that the solvent, acting as a carrier to deposit the adhesive film, can be evaporated completely off before the two surfaces are placed in contact so that the joint gains its full strength under pressure *immediately*, whereas *all* other adhesives have to be held under pressure while the solvent evaporates, and if the surfaces being joined are impervious to the solvent or vapour the drying out of the joint may take a very long time indeed.

TYPES

Rubber adhesives are of two main types: Solutions, where the rubber is dissolved in a solvent; and latex, which is the natural dispersion of rubber in a watery serium as obtained by tapping the rubber trees. The solvent in solutions is either a hydrocarbon such as benzol or petroleum naphtha, both highly inflammable chlorinated hydrocarbon such as trichlorethylene or carbon tetrachloride. The non-inflammable solvents are, unfortunately, dangerously toxic so that latex adhesives are favoured in many cases as they avoid both inflammability and toxicity hazards as well as being particularly suited for mechanical application.

Each of these main types has several sub-divisions and each sub-division has some particular use although there is a considerable amount of overlapping.

Straight rubber solutions obtained by dissolving smoked sheet or crepe in a solvent make useful cements but if the rubber is well masticated before dispersion in the solvent a much smoother solution results with a higher rubber content for the same viscosity. Such solutions are used either for making joints in rubber articles such as mackintoshes and similar proofed textiles or for joining porous surfaces such as those of leather or cloth where flexibility is needed. Shoe manufacture and upholstery are therefore large consumers of these solutions.

Rubber-solvent solutions may be compounded for vulcanisation and if vulcanising ingredients which are inactive at normal temperatures are used they may all be included in the one solution and used for building operations before vulcanisation in the manufacture of rubber or composite rubber and textile articles such as tyres and belting. Where the article being joined cannot be heat-vulcanised after the joint is made, ultra-accelerators which cure the rubber in three days, at normal temperatures, are available, but, to avoid premature curing actually in the solution, the adhesive is supplied in two parts, one containing the sulphur and the other the accelerator. The two parts are mixed immediately before use, the mixed solution having only a "pot life" of about eight to twelve hours.

STICKING RUBBER TO METAL

Rubber solutions, as described so far will stick well to surfaces of vulcanised rubber where the surface can be swollen by the solvent, thus giving a good anchorage, or to rough or porous surfaces such as those of leather, textile, fabric or unpolished wood, but they will not stick to a smooth impervious surface such as metal or Bakelite. Adhesion to such smooth surfaces may be obtained by using a primer which contains both glue and latex. The film from such a primer adheres well to metal or Bakelite and a sub

sequent coat of rubber solution adheres well to the primer because the solvent in the rubber solution swells the rubber "latex particles in the primer, thus ensuring good anchorage. To stick rubber to metal, therefore, the metal is first coated with a primer containing a material such as glue and latex, and when this is dried a coat of rubber solution is applied to the primed metal and to the rubber surface and, after drying, these are stuck in the usual way. Bonds of this type are discussed very fully in British Patent No. 575767.

The need for sticking rubber and similar extensible or flexible materials to metal has led to the development of a new type of rubber adhesive. When rubber is dissolved in a solvent and certain natural and synthetic resins are added, the deposited films will adhere strongly to metal but are apt to be soft and sticky. The toughness of the normal rubber film, however, can be resorted by a heavy loading of reinforcing fillers such as zinc oxide and carbon black, and it is this combination of rubber, resin and reiforcing filler, all dispersed in a solvent, which constitutes the basis of that versatile range of adhesives known by the brand name of "Bostik."

TABLE II.
Variation of Relative Adhesion with Resin and Filler Content of a Reclaim Rubber Adhesive.

Filler content: Vols. Zno per 100 rubber --	100	150	150
Resin content: Vols. 100 vols. rubber --	100	100	150
Relative adhesion to steel --	1.0	1.7	3.0

These adhesives have their main use in the constructional engineering industries such as motor car and aircraft manufacture and shipbuliding, and are also widely used for floor-laying, particularly for rubber flooring and tiles.

The principal use of latex adhesives is in footwear manufacture. For this the latex is compounded and modified in many ways so that it may be used for a variety of operations and applied by a variety of machines. All four properties of "dry tack", elasticity, resilience and water resistance, are taken full advantage of and the use in this industry, which is described fully in the references given below, is indeed a typical illustration of the fact that latex has a great margin of adhesive strength and will bear very profound adulteration and modification without losing its value. Many attempts were made to use synthetic latices during the war as shoe adhesives but without much success in this country. Neoprene latex adhesives were largely used in U.S.A. and this synthetic comes nearer than any other to filling the position of an adequate substitute for natural rubber in adhesives. It may be significant, however, that even in that country the reversion to natural latex adhesives for all ordinary purpose has followed rapidly on the renewed availability of the natural product, in spite of there being very little price advantage.

MODERN DEVELOPMENTS

During the last war the use of rubber adhesives of all kinds was a great feature of the enormaus industrial production for war purposes, and in spite of the very grave shortage of natural rubber an adequate supply of this raw material was always made available because the synthetic rubbers, however effective substitutes they might be in general rubber manufacture, proved so inadequate fo

adhesives, mainly because of the lack of "dry tack" but also because of their pronounced cold flow.

Two outstanding achievements during the war may be quoted: One was the production of self-sealing fuel tanks for aircraft, where the metal tank was entirely covered externally with several laminations of rubber attached to the tank by means of a primer and cold curing self-vulcanising rubber solution: the second was the waterproofing of armoured fighting vehicles for landing operations, where all apertures in the vehicle had patches of waterproof fabric stuck over them immediately before entering the water. Enormous quantities were used and luckily it was found that tyre carcass reclaim made a very good "Bostik" adhesive, since the synthetics proved practically useless for the job.

Since the war the motor industry has resumed its consumption of large quantities of rubber adhesive for the attachment of head-linings, anti-drumming materials, running board rubbers, draught-excluder strips, and boot linings, while a new consumer is prefabricated house construction where the insulation is secured to the insides of aluminium bungalows by means of a special type of rubber solution.

The use of insulation tiles and soft and hard wallboards in ordinary permanent building is a modern feature which presents a very difficult adhesive problem but in this instance also it appears that rubber adhesives of one type or another can provide the answer in nearly every case and although the extensive use of these materials is a comparatively recent development, some example of this practice where rubber adhesives were used nearly twenty years ago indicate that there is little fear that the adhesive will not endure for as long as may be necessary.

—The Role of Casein in Paper Industry

ADHESIVES play an important part in the industries wherein paper is employed, both in order to inseparably fasten together individual sheets of paper, convert paper pulp into a mouldable condition, and also for the application of thin layers of colouring matter or other coatings on paper or millboard articles. For all these purposes casein is admirably adapted, since it will stick sheets of paper together and forms thin coatings of considerable elasticity both alone or in combination with other substances. When a solution of casein is treated with small quantities of formaldehyde, and the article coated with the preparation is exposed to the air, a number of new products can be obtained. Thus, for instance, we obtain waterproof paper that can be used instead of guttapercha paper, waterproof cardboard boxes and cartridge cases, washable papers, transfer papers and so on. Utensils, more particularly basins, dishes and the like, made of paper pulp or mill board, can be rendered waterproof by treatments with formaldehyde, and used for a variety of purposes, e.g., as developing dishes in photography. Similarly, cardboard treated in the same way can be used for stereotype matrices, and will keep for any length of time. It is thus evident that the field of application open to casein is practically illimitable.

In this article we propose to describe some of the most important applications of casein in respect of paper idustry.

METACHROMOTYPE PAPER

This paper, which is used for transfer pictures, is preferably made of a fairly good, lightly sized (if at all) but smooth paper, capable of readily absorbing the thin solution of casein (preferably prepared with sodium bicarbonate) and of softening with similar case when it has to be released. The operation is be performed with a flat brush, the paper being spread on a table and the casein solution applied smoothly by working the brush in one direction. If necessary the coating is repeated, the brush being the worked at right to the previous direction.

The prepared paper is next hung up to dry on lines in a gently warmed room, preferably in a stretched condition to prevent it curling. It is afterwards cut into sheets and packed, either with or without calendering to smoothen the surface.

SIZING PAPER WITH CASEIN

Notwithstanding the most scrupulous care bestowed on the preparation of the resin soap used in sizing paper, it has been found impossible to impart the desired firmness and impermeability to the paper by the use of vegetable size. In view of the large quantities of casein now obtainable, it seemed advisable to test its suitability for sizing paper; and with this object comparative experiments were carried out by Dr. Zanardi with resin soap and casein solution.

Paper pulp was mixed with dissolved casein for twenty minutes, and to the mixture was added a solution of alum—as in resin sizing—followed by diluted sulphuric acid until a faintly acid reaction was produced. In the trials the casein was poured on at the same time as the resin soap, or else after the latter had been precipitated by aluminium sulphate. In general the addition of casein was found to have a favourable influence on the firmness of the paper and on the amount of size consumed. Casein can also be used for this purpose by itself, and furnishes a coating that will make the paper easier to roll up.

WATERPROOFING PAPER

This process is devised for making paper and fabrics waterproof to such an extent that they will stand protracted exposure to the influence of moisture without losing their softness and elasticity. At the same time they are made superior to paper or fabric coated with caotchouc, both in point of durability and freedom from smell.

In carrying out the process, glue or casein is dissolved in water or other suitable solvent and treated with an addition of sodium tungstate to improve the tenacity (if desired), the albuminous substances being then precipitated by tannin or other suitable precipitant as a viscid insoluble mass.

This mass, which is elastic and plastic while moist, becomes very hard and brittle on drying, so that it would be entirely unsuitable for the purpose in view were it not corrected by melting it in a pan (preferably before it has set) and adding glycerine, syrup, molasses, fats or oils, alone or in conjunction, the whole being well mixed. The quantity so added depends on the degree of suppleness desired, and is preferably about one-half of the mass obtained by the aforesaid precipitation.

The resulting mass for the first coating can be applied to paper or fabric before it has set, and forms a very flexible, insoluble coating resembling caoutchouc. To make the paper keep better it may be at once mounted on fabric by pressure, or pressed between two similarly treated sheets or roll lengths of paper. Of course the fabric may have been impregnated beforehand, or else the joined paper and fabric may be treated afterwards.

To improve the waterproofing qualities and impart a fine gloss, a second coating is applied of any convenient waterproof varnish or lacquer. Colouring matters can be incorporated with the first or second coating, according to choice.

CASEIN SOLUTION FOR COATING PAPER

A casein solution, suitable for coating paper and for other purposes, can be prepared, according to W. A. Hall's English patent, by mixing casein (precipitated with hydrochloric acid) with 10 to 15 per cent. of its weight of sodium phosphate, preferably trisodium phosphate, preferably trisodium phosphate, and 1 to 3 parts of water to each 1 part of casein.

WATER—AND FIRE-PROOF ASBESTOS PAPER AND BOARD

An essential preliminary is to isolate the asbestos by chemical means, in order that it may retain its flexibility in presence of the subsequently added ingredients, and not become brittle.

This treatment is preferably effected by means of a saline solution or dilute glycerine, the latter being more convenient in practice.

The asbestos is first mixed with 4 to 6 per cent. by weight of glycerine, followed by 5 to 10 parts of water. The medium formerly used for binding together the fibres of asbestos was fish glue (especially in the Ladewig process); but casein will accomplish the same purpose more effectually and at far less cost.

The mixed asbestos and casein (e.g., casein and borax solution) is next reduced to fine pulp in a mill. This impregnation isolates the asbestos fibres and prepares them chemically in such a manner that they are no longer exposed to any injurious action on the part of subsequent adjuncts, as was formerly the case.

The well-ground mass is treated with 2 to 3 parts of resin soap (previously dissolved in hot water), the whole being well mixed and afterwards treated with about 6 parts of zinc chloride dissolved in 15 to 25 parts of water, and finally by 20 parts of graphite in suspension in about 50 parts of water. The graphite makes the mass fireproof and gives it the appearance of vulcanite.

For use as a packing in pipe flanges that have to be frequently opened, this material may be covered with wire gauze on one or both sides.

The finished, intimately mixed mass is worked up into paper of millboard of any desired thickness, in the usual kind of machines for these purposes. The product is afterwards pressed, dried in the air, and impregnated with a 1 per cent. solution of zinc chloride. It is then redried, passed through a ½ to 1 per cent. aqueous solution of resin soap (prepared by dissolving the resin soap in spirit and then in water), and finally dried again in the air. The appearance is improved by calendering. The finished article is elastic and completely fire and waterproof.

PAPER FLAKES, ETC., FOR OILS AND FATS.

Vessels of different shapes can be manufactured from paper by reducing well-sized paper to pulp. A useful paper for this purpose consists of about the following proportions:—

Rag	10 parts.
Straw	40 ,,
Brown cellulose	50 ,,

The paper is impregnated with a solution of casein, in order to render it impermeable and at the same time to make the individual sheets of paper stick together. With this object, the sheets of paper are coated on both sides with an ammoniacal solution of casein, laid on top of the other, and at once placed in heated moulds, the pulp being stamped, by means of a press, into a tray or basin of the form most suitable for the purpose in view.

The moulds are made in two halves. In the case of a flask or bottle, for instance, the basin is fitted at the top with a lug for receiving the stopper, with the neck, and, underneath, the part on which the bottle is to stand. The stamping mould is gently warmed before the paper is inserted, so that the casein solution sinks more deeply into the pores, and at the same time the ammonia has a better chance of evaporating. After a short time the paper mass will have set hard, and the finished half bottle can be taken out, and left in the air to try completely. These halves are afterwards thinned down at the edges where they are to be joined, pressed together, cemented with casein glue, and coated with a thin layer of casein solution inside and out.

WASHABLE DRAWING AND WRITING PAPER

Any convenient sort of paper is treated with a first coating of casein, size or other suitable medium containing an admixture of some finely pulverised mineral substance, such as zinc white, chalk, lime, heavy spar, etc., and the requisite colouring matter. It is then brushed over with, or dipped in, waterglass containing a small quantity of magnesia, and left in the air for a short time to dry, at a temperature of about 77°F. This second coating may be replaced by one of dilute formaldehyde.

Paper treated in this way may be written or drawn upon with pencil, chalk, coloured crayon, charcoal, transfer ink or lithographic ink; and the marks thus produced may be washed off again without any appreciable alteration of the paper.

Paper of this kind possesses the advantage of great economy in use for schools, and designers. In drawing plans, for instance, the design can be easily and rapidly removed with a damp sponge, and a fresh drawing made at once on the same sheet. Such paper forms an excellent substitute for the heavy slates used in schools for writing and drawing lessons; and is highly advisable for this purpose, inasmuch as it can be made in colours that will not fatigue the eye.

Nevertheless, it cannot be denied that repeated writing and washing soon wears out the protective coating, and that the sheets will not last very long, especially under the heavy wear to which they are subjected in school work.

—Useful Hints to Feed Farm Animals

THE food in the body is used to maintain or support life to produce growth or energy or to promote certain other features, as milk, fat, or wool. On this account persons who feed live stock should regulate the kind and amounts of food, if they desire to secure the most satisfactory results. The purpose of this article is to suggest the ways and means of feeding live-stock so as to keep them stout and strong to perform their respective work with satisfaction to those who have kept them.

FOOD OR COWS

The Cow's food is one of the things that needs the most careful attention. Cows are clean and fastidious feeders, and every cow will not eat the same kind of food. Fowls, Sheep, Goats, Pigs, and Dogs should not be allowed to go near the dairy cattle food. Some food should always be given to the cow immediately before she is milked. A pound of wheat bran sprinkled over the food that remains in the feeding trough in the morning is all that is necessary.

The kinds of grain that are good for cows are kullic or woorid (black dal), barley, wheat, peas, gram, and arhar. All other grains are more or less injurious. Rice is good for sick cattle, but has not much nutriment. Indian corn fattens, but does not increase milk but its bran is better. Khassari should never be given to cattle, goats, or sheep. It is very heating and dries up the milk, and is also very indigestible and stunts the growth. Gram and peas should be given to only heavy milkers and weak cows and then not more than one or two pounds a day to each.

The following mixture should be divided into two or more meals in 24 hours, and is sufficient for a milch cow of ordinary size giving from 20 to 24 lbs. milk, but a very large cow or cows giving 8 to 10 lbs. of milk will need only half or even less the quantity.

Kullic or Maskullic	4 lbs.
Wheat bran (Bhoosi)	2 ,,
Kullic, peas or raha bran	3 ,,
Mustard Oilcake	2 ,,
Cottonseed, gram or pea meal	1 lb.

Chaft (Bhoosi), wheat, barley or oats chaff 10 lbs.

Green grass, chopped fine	40 lbs.
Salt	2 oz.
Sulphur	½ ,,

PREPARATION OF FOOD

All the grain should always be ground fine and steeped in clean water. Four pints of water should be added to every pound of grain, and then it should be allowed to soak for 3 or 4 hours before feeding, and if allowed to soak longer it ferments and brings in stomach trouble. Kullic should be boiled; or should be ground fine and soaked for hours. When kullic is boiled, it seems to disagree with cattle at first, but they soon become accustomed to it.

The wheat-bran should be given dry mixed with the other food, but if the bran be old or there be insects in it boiling water must be poured on it before it is given to cattle or horses.

The cotton-seed should be thoroughly ground, and soaked until it gets quite soft.

The oilcake should be broken up into small pieces, and soaked for 3 to 4 hours.

The chaff, grass, hay, and straw should be chopped into pieces two inches in length.

The salt and sulphur should be ground and added to the grain when put to steep.

All the ingredients should be well mixed up with a sufficient quantity of water or rice-kanji to make it sloppy.

Great care must be taken that none of the grain is given whole and unsoaked, and that the food is not given dry. The milch cows, during summer specially, should be given a draught consisting of goorh (molasses) 1 seer, satoo ½ seer and water about 2 gallons, occasionally during mid-day.

Newly calved cows may be allowed daily for 3 to 4 weeks or more in order to incite the full supply of milk.

Oilcake helps to produce milk and butter. All oilcakes are not good for milch cows or young calves. The best are those made from til, ulsee, or teesi (linseed), cocoanut and the groundnut. Other kinds of oilcake, e.g., mustard, is a good appetizer and also helps digestion but is very heating and therefore injurious to cows. Linseed and til-seed oilcake are good for calves, especially when under three months of age. Mustard-seed oilcake may be given to calves only after they are three or four months old and then only in small quantities to begin with. The oilcake made from the mustard or rapeseed is good for bullocks and bulls and large-growing calves.

Other suitable food mixtures for cattle are as follows:—

DAIRY CATTLE FOOD

FOOD FOR COWS ON POOR PASTURE.

I

Corn meal, ground barley, or wheat or sorghum grain chops	500
Cottonseed meal ..	300
Wheat bran ..	200
Ground oats ..	100
Ground limestone or oyster shell	22
Salt ..	11

II.

Corn meal, ground barley or wheat ..	100
Rice bran or wheat bran ..	100
Ground oats or barley ..	100
Cottonseed meal ..	100
Ground limestone or oyster shell ..	8
Salt ..	4

FOOD FOR COWS ON FAIR PASTURE

I.

Corn meal or sorghum grain chops ..	600
Wheat bran or ground oats ..	200
Cottonseed meal ..	25
Salt ..	8

II.

Sweet potato meal ..	300
Ground oats or wheat bran or rice bran ..	100
Cottonseed meal ..	100
Salt ..	4

FOOD FOR COWS ON FAIR PASTURE

I.

Cornmeal, ground wheat or sorghum grain chops ..	400
Ground oats or barley ..	200
Wheat bran or rice bran ..	100
Cottonseed meal ..	100
Ground limestone or oyster shell	8
Salt ..	8

II.

Whole-pressed cottonseed ..	200
Ground wheat, corn meal or ground barley ..	300
Dried citrus peel and pulp or dried beet pulp ..	200
Ground limestone or oyster shell	7
Salt ..	7

MOLASSES CATTLE FOOD

I.

Corn sugar molasses ..	37
Canesugar molasses ..	63

II.

Beet sugar molasses	..	50
Canesugar molasses	..	50

FOOD FOR BULLS

Many persons neglect the bull, and feed him very meagre rations, so that he often looks thin and poorly fed. The bull should never be fat and in high condition, but he should look in good muscular form, full of vigour and ambition. He should have plenty of suitable hay and feed of concentrates in which protein is abundant. If he is at the head of a large herd and in service, then he should be fed about the same amount of nutrients as a dairy cow, otherwise less food is needed. From 5 to 10 pounds of grain a day may be fed, depending upon the size and work of the animal. Some persons object to silage for the bull, thinking that this food make him sterile, and do not feed it, but it may be fed satisfactorily if in not great an amount, as 10 or 12 pounds, for example.

The following is sufficient for two meals for a large Montgomery or Sindi bull, but an Ongole or Hissar bull will need probably 2 lbs. more of gram and less of bran, grass, and chaff.

Gram (broken)	..	2 lbs.
Mustard oilcake	..	1 lb.
Wheat bran	..	3 lbs.
Green grass	..	8 to 10 lbs.
Chaff (bhoosa) or straw	..	16 to 20 ,,
Salt	..	2 oz.
Sulphur	..	½ ,,

Besides this quantity of food, wherever it is possible, the bull should be tied out to graze. When there is no grass lands for the bull to graze on, he should be allowed as much extra grass or straw as he will eat young jowar and maize stalks and leaves should be given instead of straw when available.

When green food is not procurable additional chaff (bhoosa), straw, and 2 lbs. of wheat bran or 1 lb. of gram must be allowed.

FOOD FOR POULTRY FOWLS

The foods suitable for fowls vary widely in kind and character. In fact, farm poultry will eat almost anything that has any nutritive value. But as a rule they are fed the cheapest and most common foods grown locally. The kind of food, however, may vary according to the age and condition of the birds, and the purpose for which they are kept.

As the feeding of poultry has been elaborately dealt with in our previous issue we totally refrain from repeating it here except a few useful feeding compositions.

Efficient chick-starter and growing mashes, are used for proper development of chicks and pullets. Protein, largely of vegetable origin, in the growing mash encourages normal development, pullets are not likely to lay until fully developed and they lay longer.

Feed the all-mash starter when chicks are 24 hours old; continue until 6 to 10 weeks old. A mixture of equal parts of mils or kafir chops, cracked wheat and yellow corn chops is a good scratch grain. kept in feeders after chicks are a month old. The No. 1 all-mash chick starter may be used as a broiler mash until broilers are 10 or 12 weeks old, with small amounts of grain added 2 to 4 weeks before they are marketed. If chicks are raised for layers, pullets and cockerels should be separated early and pullets kept in green range. Fold the growing mash until pullets are 5 months old.

Cottonseed meal is generally recommended for young chickens and turkeys In laying rations, it should be limited to mixtures for layers whose eggs will be

consumed fresh, and should not exceed 6% of the total mash. This meal may cause dark yolks in eggs in storage.

FOOD FOR HORSES AND MULES
MAINTAINING IDLE STOCK

	All-mash chick starters.		Growing Masses.	
	I.	II.	I.	II.
Yellow Corn meal or sorghum Grain Chops	44	38	46	35
Finely ground oats or barley	10	4	12½	15
Wheat grey shorts or rice polishing	20	8	15	20
Wheat or rice bran	—	20	—	—
Cottonseed meal	6	8	12	10
Peanut meal or soyaben meal	—	4	—	10
Alfalfa leaf meal	5	5	7	6
Meat scraps or fish meal	6	6	4	—
Dried milk (skim or butter milk)	6	3	—	—
Ground limestone or oyster-shell flour	2	2½	2	1
Bone meal	½	—	1	2
Salt	½	½	½	1
Codliver oil	½	1	—	—

TURKEY FOOD

For rapid gains, high finish and best prices, turkey production requires full feeding from hatching time until sale. Turkeys should always have access to mash, turkey, size grit, fresh water and plenty of green feed, with grain in feeders or fed heavily each night. Raise turkeys on clean range where chickens have not been kept; change feeding grounds weekly; and more roosts frequently.

A good starter mash for poults is: 18 lbs. of corn mesh, 12 lbs. of ground wheat or sorghum grain, 15 lbs. of finely ground oats or barley, 8 lbs. of wheat or rice bran; 3 lbs. of alfalfa leaf meal; 20 lbs. of cottonseed meal; 12½ lbs. meat or bone scraps; 5 lbs. of dried milk or whey; 1 lb. ground limestone or oyster shell flour; ¼ lb of salt and ½ lb. of codliver oil. A grain mixture may be kept before poults, in a separate feeder, after the third week. The starter mash should be fed until poults are 8 weeks old, when a gradual change should be made to the growing mash.

A growing mash, to feed with grain, is: 100 lbs. of a combination of 3 ground grains, mixed with 8 lbs. of alfalfa leaf meal, 8 lbs. of meat and bone scraps, 15 lbs. of cottonseed meal, peanut or soyabean meal, 2½ lbs. of calcium supplement and ½ lb. of salt.

POULTRY FOOD INCREASING THE WEIGHT

To every 100 lbs. of food add ½ lb. glyceryl monstearate. Mix well and then add to the mixture 250-300 lbs. water. Use hot water if available as it will shorten the time to get a uniform mix. Use this mix as soon as possible as it tends to ferment. This is fed for 4 or 5 days before killing or selling in the market.

FOOD FOR HORSES AND MULES

The use of the horse is very great. So to keep the horse fit to do its respective duty is to provide it with good food. But the food, most desirable for horses vary according to condition of age, work, and locality.

The following rations are prescribed in U.S.A. to the horse according to the type of work done by this.

MAINTAINING IDLE STOCK

	I.	II.	III.
Ooats, corn, sorghum grain chops or coarsely ground barley	2	—	—
Ear corn chops or grain sorghum head chops	—	2	2½
Cottonseed meal or cake	1	1	1½
Grass or hay	—	12	6
Legume hay	8	—	—
Cotton hulls groat straw	9	—	6

RATIONS FOR LIGHT WORK

	I.	II.	III.
Ooats, corn, sorghum grain chops or coarsely ground barley	5	—	—
Ear corn chops or sorghum head chops	—	6	6
Cottonseed meal or cake	1	1	1½
Grass or hay	—	11	5
Legume hay	3	—	—
Cottonseed hulls	9	—	6

RATIONS FOR HEAVY WORK

	I.	II.	III.
Ooats, corn, sorghum grain chops or coarsely ground barley	10	—	—

Ear corn chops or sorghum head chops	—	11½	11
Cottonseed meal or cake	1½	1½	2
Grass or hay	—	10	5
Legume hay	3	—	—
Cottonseed hulls	8	—	5

FOOD FOR SHEEP

I.

Ear corn chops or Milo head chops	1½ lbs.
Cottonseed meal or cake	½ ,,
Sweet sorghum fodder or hay	½ lb.
Cottonseed hulls	1 ,,
Ground limestone or oyster shell flour	4 to 10 oz.

II.

Corn, barley or milo	1 lb.
Cottonseed cake	⅓ ,,
Hay	1½ ,,
Ground limestone or oyster shell flour	4 to 10 oz.

III.

Sorghum grain, barley or wheat	1 lb.
Cottonseed meal	¼ ,,
Ground grain sorghum fodder	1½ ,,
Ground limestone or oyster shell flour	4 to 10 oz.

FOOD FOR PIGS

	I.	II	III
Corn meal or sorghum grain chops	65	50	60
Coarsely ground wheat of finely ground barley	—	40	—
Ground oats	25	—	15
Rice bran or polishings	—	—	15
Cottonseed or peanut meal	7	7	6
Meat scraps or fish meal	3	3	4
Limestone or wood ashes	1½	1½	1
Salt	¼	[illegible]	[illegible]

—STORING SEED POTATOES

STORING of seed potatoes in artificially lighted cellars to check their sprouting and consequent loss of nutrient under ordinary storage conditions is discussed (Philips Tech. Rev., 1949, 10, 318).

Sprouting is checked at low temperatures (2° to 4°C.), and which little light at 5° to 9°C. While the former method is neither practicable nor economically justifiable, the latter involves tedious temperature regulations in the frosted glass-sheds where the potatoes have to be stored.

The effects of artificial light on sprouting were, therefore, investigated. One part of an underground test cellar with potatoes so stored in shallow boxes as to allow light to penetrate between them was illuminated with ordinary incandescent lamps and another part with fluorescent lamps of the "daylight" colour. The lighting was on continuously for a period of 3 months after which period the potatoes were taken out for planting.

In the first part lighted with 6 incandescent lamps installed in each section of 7×8 m., placed at intervals of 3 m., potatoes were found in a better condition than those which had been kept in clamps, but sprouting was not well checked. Firstly, the potatoes in the immediate vicinity of the lamps sprouted strongly not withstanding the fact that they were received a fair amount of light. This is explained by heat radiations from the lamps which helped sprouting. Secondly, light being radiated from a central point in the incandescent lamp, there was little uniformity in the radiation. Large spaces were, therefore, left without any light. The second part of the cellar illuminated with 5 TL fluorescent lamps of 40 w. installed in each section of 7×8m. gave better results. In this case radiation of light was uniform all through and there were no shadow points, the lamps being mounted vertically against the wall. Moreover, there was scarcely any heat radiation to promote sprouting.

Investigations were then made on the kind of light which checks sprouting most and to ascertain what amount of light—using light of a certain wavelength—was just capable of sufficiently checking sprouting.

One lot of potatoes was irradiated with various intensities of blue and another lot with different intensities of red light. For the first lot a TL lamp was used with magnesium tungstate as luminophore and the addition of a blue filter; for the second lot a lamp with cadmium borate was used, with a red filter. The irradiation took place at 140°C. It was found that blue-violet light strongly checked the growth of sprouts, while red rays had but little effect.

Very little research having been done into the mechanism of sprouting of potatoes, it was presumed that the blue-violet light destroys the auxin— a hormone which is responsible for growth of sprouts.

Further irradication tests were so arranged that the light fell continuously upon the potatoes from one side (as would be the case in the storing of potatoes).

Under blue light of an intensity up to about 30 erg./sq. cm. sec., the sprouts were perceptibly checked in growth. The sprout that had received about 2

erg./sq. cm. sec. was still somewhat phototropically directed.

Potatoes under red light, however, showed an unexpected phenomenon. Even a much lower luminous intensity of 1 erg./sq. cm. sec. (than with blue light) produced noticeable result. Moreover, the checked sprouts did not grow towards the light, not even under much stronger radiations.

From these experiments it appears that the checking of sprouting—at least under the influence of red light—is not to be accounted for by reason of growth-stimulating substance being rendered inactive by the light. Rather it is to be supposed that, under red light, a growth-checking substance in the potatoes is activated. The question whether this hypothesis of activation of a growth-checking substance is correct is to be further investigated experimentally.

—Journal of Scientific & Industrial Research.

PHARMACEUTICAL RECIPES

RINGWORM OINTMENT

Vaseline	8 oz.
Hard paraffin	1½ „
Chrysophanic acid	½ „
Ichthyol	1 dr.
Oil of cinnamon	10 drops.

Melt the vaseline and paraffin over a water bath and when liquid add the remaining ingredients and stir till cold.

SODA MINT TABLETS

Sodium bicarbonate	25.0 grms.
Oil of peppermint	0.3 c.c.
Light liquid petrolatum	1.0 „
Starch, in fine powder to make 100 tablets	4.0 grms.

Mix the oil of peppermint and liquid petrolatum with the starch, add the sodium bicarbonate, and mix thoroughly by gentle trituration.

Compress in a tablet machine, using 8 mm. die and punch to make 100 tablets.

BRAHMI OIL

In preparing this medicated oil, sesame oil is generally used. This oil, before being boiled with medicinal substances is first of all heated to deprive it of any water by evaporating. It is then purified by steeping in it the following substances for 24 hours viz., madder 1/16 part in weight of oil, turmeric, wood of symplocos racemosa, tubers of cyperus rotundus, a bark called nilaka, the three myrobalans, root of pavonia odorator and the tender shoots of pandanus odoratissium, each one sixty-fourth part in weight of the oil. These ingredients in fine powder should be soaked in the oil, with the addition of an equal quantity of water for a day. The mixture should then be boiled till the water is evaporated, and finally strained through clean cloth. To the oil thus prepared dried brahmi herb is added in the proportion of 4 parts of the herb to 16 parts of oil The mixture is then boiled till the watery parts are all evaporated. This is then allowed to cool and strained.

EXTRACT OF ASOKA

Asoke bark, in moderately coarse powder	20 oz.
Alcohol, 90 p.c.	12. fl. oz.
Distilled water to make	20 „

Boil the asoka bark with 40 fl. oz. of distilled water for 30 minutes and strain. Repeat the process twice, mix the strained liquids and evaporate to 7 fl. oz. Add alcohol, set aside for 7 days, decant the clear liquid and add sufficient distilled water to produce the required volume.

ECZEMA OINTMENT.

Acid boric	40 gr.
Acid carbolic	½ dr.
Sulphur	½ „
Camphor	½ „
Ichthyol	½ „
Starch	½ oz.
Zinc ointment	1½ „

Mix by trituration.

COMPOUND TINCTURE OF BENZOIN

Benzoin, in powder	100 grammes.
Storax	75 „
Balsam tolu	25 „
Aloes	20 „
Alcohol, 90 p.c. to make	1000 c.c.

Macerate the benzoin, storax, balsam tolu, and aloes with 800 c.c. of alcohol in a closed vessel for 2 days, shaking occasionally; filter, pass sufficient of the alcohol through the filter to produce the required volume.

INSECT SPRAY

Refined kerosene oil	1 gallon.
Rectified turpentine oil	4 fl. oz.
Citronella oil	4 „
Oil of wintergreen	2 „
Eucalyptus oil	2 „
Camphor	1 oz.
Lemon grass oil	½ fl. oz.
Carbolic acid	1 dr.

Mix and keep in well closed cans. Use with a sprayer.

ANTI-RHEUMATIC LINIMENT

Capsicum	1 oz.
Oil of turpentine	1 pint.
Menthol	1 oz.
Oil of origanum	3 dr.
Oil of Gultheria	1 oz.
Oil of camphor essence	1 pint.

Macerate the capsicum with the turpentine oil and then add the other ingredients one by one.

MENTHOL TOOTHACHE DROPS

Menthol	8 parts.
Chloroform	8 „
Alcohol	84 „

Mix the ingredients as intimately as possible. In case of toothache resulting from caries, little cotton wool is soaked in the preparation and inserted in the hollow of the tooth.

—Recipes for Small Manufacturers

MOSQUITO POWDER

Oil of eucalyptus	1	oz.
Powdered talcum	2	"
Powdered starch	14	"

Mix. This powder is to be rubbed into the exposed parts of the body to prevent the attack of mossuito.

DEODORANT PASTE

Glyceryl mono-stearate	15	parts.
Mineral oil	2	"
Glycerine	4	"
Formaldehyde	1½	"
Alcohol	9	"
Oxyquinolin sulphate	3	"
Water	63½	"
Perfume as desired.		

Dissolve the oxyquinolin sulphate in a small part of water. Dissolve the perfume in the alcohol and add the formaldehyde. Put the rest of the ingredients into a mixer, turn on the heat, and stir until all the ingredients are melted and a smooth white emulsion is formed. Shut off the heat, continue the stirring, add the oxyquinolin sulphate solution and when the temperature drops to about 50°C add the perfume—formaldehyde solution.

JAPAN BLACK VARNISH

Burnt umber	12	parts.
Asphaltum	6	"
Boiled linseed oil	300	"

Dissolve the asphaltum in a small portion of the oil with the aid of heat, then add the umber, previously rubbed up with oil, and finally the remaining oil; mix the whole thoroughly, allow it to cool, and thin with oil of turpentine. This varnish is very elastic.

SEWING THREAD

Sewing thread, and the various kinds of thread used in the manufacture of bobbin-net, lace, and some other kinds of textile fabrics consists of two or more yarns (simple spun threads) firmly united together by twisting, just as a rope stand consists of several yarns or distinct cylinders of humps.

The operation of combining yarns of cotton or lines into thread is performed by a machine called a doubling and twisting frame somewhat resembling the throstle of the cotton-spinner. Along the centre of the machine is an elevated creel or frame-work which supports two parallel rows of cops or bobbins of yarn, one row towards each side of the machine. From the cops the yarns are conducted over horizontal glass rods, which are fixed parallel with the creel, and thence downwards into troughs filled with water or very thin starch paste which by moistening the yarn, facilitates the subsequent process of twisting. After being wetted, the yarns pass over the rounded edge of the trough, which is covered with flannel for the purpose of absorbing the superfluous moisture and thence under and partly around an iron roller, which is made to revolve with any required velocity by a train of wheel work. Upon this roller rests another, of box wood, which revolves solely by contact with the iron roller, its axis playing in vertical slots. In passing under the iron roller, then between it and the wooden roller, and finally over the latter, the yarns required to form the thread are brought together and slightly compressed and they are finally twisted by apparatus very like that used in throstle spinning.

COSMETIC FOR THE HAIR

Olive oil	10	oz.
Spermaceti	2	"
Oil of bergamot	2	dr.
Oil of cloves	10	min.
Oil of rose-geranium	40	"

Heat the olive oil and spermaceti together over a slow fire and then add the essential oils and put in mould.

CANDIED GINGER

Grate an ounce of ginger, and put it with a pound of refined sugar beaten fine, into a tossing pan with water to dissolve it. Stir well together over a slow fire till the sugar is beaten finely, and continue stirring it till it is thick. Then take it off the fire, drop it into cakes, upon earthen dishes, set them in a warm place to dry; they will be brittle, and look white.

ARTIFICIAL GOLD

Copper	90	parts.
Gold	2½	"
Aluminium	7½	"

Melt the copper and the gold in a crucible composed of refractory material or of a mixture of unburnt fire-clay and dust of fire bricks, glass pots or seggars and when the metals are fluid the aluminium is added. When not more than 2 lbs. of the alloy are made at a time the mass is kept in a fuse state for half an hour, about 1½ oz. of borax being added as a flux. The melted mass is then poured into ingots.

VARNISH FOR VIOLIN STRINGS

A good varnish for violin strings is made as follows:—

Coarsely powdered copal and glass each 4 oz.; 64 over-proof sprit 1 pint: camphor ½ oz.; heat the mixture with frequent stirring in a water bath, so that the bubbles may be counted as they rise until solution is complete, and when cold decant the clear portion.

—IN THE FIELD OF INVENTION

INSECT-PROOFING OF COTTON FLOUR BAGS

Discovery of a new treatment to make cotton flour bags insectproof without impairing the quality of the flour is claimed by U. S. Dept. of Agriculture. The most effective treatment is stated to consist in spraying 10 mg. of pyrethrins alone or mixed with 100 mg. of piperonyl butoxide per sq. ft. of cloth. Bags so treated admitted no insects during seven months of exposure to flour moth (USIS).

WOOD PRESERVATIVE.

A new chemical wood preservative, copperized chromated-zinc chloride, developed by Koppers & Du Pont, is described (Chem. Eng., 1949, 56, 186).

Copperized CZC (Chromated-Zinc Chloride) containing 73 per cent zinc chloride, 20 per cent sodium bichromate, and 7 per cent cupric chloride possesses greater permanence of its toxic constituents than CZC. The metal corrosion factor, the glow characteristics, the handling and control, however, of the two preservatives are reported to be about the same.

NEW DRUG FOR T. B. TREATMENT

Tibione, a new drug for use in the treatment of tuberculosis has been developed by four German scientists.

Derived from coal tar, tibione has been tested in German hospital and clinics during the last two years and some seven thousand persons have been treated with it.

The announcement of this discovery came as a result of investigations conducted in Germany by Welsh McDermott of Cornell University and Dr. Corwin Hinshaw of San Francisco.

It was developed by Professors Derhard Domegk and Hans Sehmidt and Doctors Robert Bemisch and Prits Mietzsch, all working at the Bayer pharmaceutical laboratories in Eberfield. Professor Domegk had been awarded the Nobel Prize for the development of the first sulfonamide.

Tibione which is shortly to be released in the United States may be used with streptomycin for the treatment of tuberculosis.

NEW EMULSIFIER

Emulsifier S-1072, a new emulsifier, is an amber coloured, viscous liquid which does not contain sulphonates. It is readily and clearly soluble in orthodichlorbenzene in the cold and is, therefore, of interest for the manufacture of orthodichlorbenzene emulsion concentrates. The concentrate emulsifies rapidly, with little agitation, in water over a wide range of concentive as the emulsifier of orthodichlorbenzene emulsions concentrates used to control the bacterial growth and putrefaction odours in refuse dumps in large cities. A concentrate is made using 25-30 per cent. Emulsifier S-1072 and 70-75 per cent. orthodichlorbenzene, both by volume. One part of the concentrate is emulsified in 50-100 parts water. This makes a satisfactory stable emulsion suitable for spraying.

The new emulsifier is marked by the Glyco Products Co., Inc., Brooklyn 2, N. Y., FOB Natrium (New Martinsville) W. Va.

—CHEMICAL PRODUCTS.

ROTARY VACUUM FILTER

Paxman filters for the chemical, food and allied industries may be either of cast iron or fabricated steel construction, while for the handling of corrosive effluents, or where absolute purity of product, either filtrate or filter cake, the prime consideration, white or black rubber covering, stainless steel, monel, aluminium or other alloy metals may be employed in the construction.

The drum box consists of a suitable number of self-contained vacuum and pressure-tight cells or compartments which are an integral part of the whole and communicate with ports in the valvehead. Each cell is so shaped that the application of the vacuum is proportioned evenly over the width or face of the drum, so that the flow of filtrate from face to outlet is not interrupted during its passage.

A perforated filter plate with suitable jointing is secured to the face of the drum, the material of the plate depending upon the nature of the slurry being handled.

The filter medium, on which the filter cake builds up, may be of cotton or linen cloth, wool blanket, or gauze of monel metal, stainless steel, phosphor bronze or copper.

The trunnions support the filter drum; in the case of smaller filters one trunnion is ported and one plain, whilst the larger sizes have both trunnions ported. Removable wearing faces are provided for the ported trunnions so that these faces may be skimmed up if necessary.

The cake is normally removed from the drum by means of a scraper knife, although for the removal of colloidal cakes such as kaolin, whiting etc., a positively-driven doctor roller is substituted for the scraper knife.

A trough in which the drum rotates forms the slurry feed tank. It is provided with an oscillating agitator, the design and pre-determined speed of which prevents the solids from settling, the drive to the agitator being through a worm reduction gear from an independent

—FORMULAS, PROCESSES & ANSWERS

PREPARATION OF EXTRACTS

373 M.K.C., Mysore—Desires to learn the process of preparing extracts.

Extracts are prepared by exhausting crude drugs by means of suitable menstrua, the finished preparations being of various forms.

The solid extracts vary according to the amount of moisture left in them and may be classified as :—

Thin (soft) Extracts.
Thick (firm) Extracts.

When the whole of the moisture is removed they become dry (Powdered) extracts.

The liquid extracts are usually prepared of such strength that 1 fl. oz. represents the active ingredients of 1 oz. of the crude drug. The exceptions to this rule are the cases of the liquid extracts of the more potent drugs which are usually standardised to a definite strength of active ingredient.

The menstruum used for extracting the drug depends on the nature of the drug. It may be water, strong alcohol, or varying mixtures of the two. Sometimes glycerine is added to the alcoholic menstruum.

Since so many methods are used in the preparation of the extracts, details of the principle be consulted from standard books.

TARAL ALTA

375 O.S., Chaibassa—Wishes to have a good formula of taral alta.

Rhodamine B Extra	1	oz.
Brilliant crociene	2	,,
Rectified spirit	4	,,
Glycerine	1	lb.
Glue	2	oz.
Water	40	,,

Soak the glue in a portion of the water for a couple of hours; then warm and mix the remaining water. Raise the temperature to boiling point and add the colours and glycerine. Then set aside to cool. When cold add the spirit and bottle.

SOLE POLISH

429 P. L. S., Agra—Wants to have a formula of sole polish.

Melt 1 part of stearine in an iron pot over slow fire; remove the pot and place it in another room or in the open air; add 4 or 5 parts of benzine; stirring vigorously. Put the soles with this mixture and polish with linen rag.

GREEN OINTMENT

430 J. M., Dindigul—Wishes to have formula of green ointment.

Vaseline	40	parts.
Wintergreen oil	10	,,
Eucalyptus oil	2	,,
Camphor oil	2	,,
Menthol	2	,,
Wool fat	20	,,
Verdigris	2	,,

Melt vaseline and wool fat over water bath. Dissolve the menthol into the mixture of oils. Then mix thoroughly with the melted vaseline and wool fat after removing it from the water bath. Lastly incorporate the verdigris or any other green pigment.

ITCH OINTMENT

Vaseline	12½	oz.
Flowers of sulphur	2	,,
Bicarbonate of potassium	1	,,
Oil of bitter almonds	1	dr.

Put the vaseline in a glass or porcelain vessel and place it over a slow fire. When it completely melted, remove from the fire and incorporate the other ingredients one by one.

BLACKENING GUN BARRELS

459 S. A. H., Bhopal—Wishes to know the methods of blackening and browing gun barrels.

A blue black effect on gun barrels may be obtained by the following method :—

Lead acetate	50	gr.
Sodium thiosulphate	50	,,
Water	4	oz.

The solution is used hot, the article to be coloured being completely immersed. A variety of colours is obtained, and as soon as the pale blue stage is reached the steel is taken out of the liquid washed.

BROWNING GUN BARRELS

Sweet spirit of nitre	2	oz.
Ferrous sulphate (Saturate solution)	1½	,,
Copper sulphate	2	,,
Solution of antimonious chloride	2½	,,
Water	60	,,

Mix all except the water, and after [illegible] hours add the water, clean the polished steel with lime water, and apply the solution. After 24 hours give it another application. Clean and polish with olive oil or [illegible] oil.

ARTIFICIAL GEMS

512 S. N. G., Bombay—Desires to know the process of manufacturing artificial gems.

The raw materials for the production of artificial gems are the finest silica and, as a rule, finely ground rock crystals; white sand and quartz, which remain pure white even at a higher temperature, may also be used.

Artificial borax is given the preference, since the native variety frequently contains substances which colour the glass. Lead carbonate or red lead must be perfectly pure and not contain any protoxide, since the latter gives the glass a dull, greenish hue. White lead and red lead have to dissolve completely in dilute nitric acid or without leaving a residue; the solution, neutralised as much as possible, must not be reddened by prussiate of potash. In the former case tin is present, in the latter copper. Arsenious acids and saltpetre must be perfectly pure; they serve for the destruction of the organic substances. The materials, without the colouring oxide, furnish the starting quantity for the production of artificial gems; such glass pastes are named "strass."

The emerald, a precious stone of green colour, is imitated by melting 1,000 parts of strass and 8 parts of chromic oxide. Artificial emeralds are also obtained with cupric acid and ferric oxides, consisting of 43.84 parts of rock crystal; 21.92 parts of dry sodium carbonate; 7.2 parts of calcined and powdered borax; 7.2 parts of red lead; 3.65 parts of saltpetre; 1.21 parts of red ferric oxide, and 0.6 parts of green copper carbonate.

Agates are imitated by allowing fragments of variously coloured pastes to flow together, and stirring during the deliquation.

The amethyst is imitated by mixing 300 parts of a glass frit with 0.6 parts of gray manganese ore, or from 300 parts of frit containing 0.8 per cent of manganic oxide, 36-5 parts of saltpetre, 16 parts of borax, and 15 parts of minium (red lead). A handsome amethyst is obtained by melting together 1,000 parts of strass, 8 parts of manganese oxide, 5 parts of cobalt oxide, and 2 parts of gold purple.

Latterly, attempts have also been made to produce very hard glasses for imitation stones from alumina and borax with the requisite colouring agents.

The starting point for the preparation of borneol or art. camphor is pinene, a terpene hydrocarbon, which may be obtained pure by the fractional distillation of turpentine oil.

Two main types of process for synthetic camphor manufacture exist, viz. those which proceed by converting pinene into a hydrochloride derivative, and those which treat pinene with organic acids.

In the first process dry hydrochloric acid gas is led into dry pinene and the white solid product pinenehydrochloride is isolated. The chlorine atom is removed by heating with alkaline reagents, when a hydrocarbon, camphene, is obtained. This when treated with the lower fatty acids and a little hydrochloric acid forms an ester of isoborneol and also (a little) of borneol. Next the isoborneol and borneol is obtained from the ester by saponifying, and converted into camphor by gentle oxidation. The yield of camphor from solid pinenhydrochloride may amount to 95 per cent. of the theory.

In the German Patent Process of Bertram camphene is converted into the ester of isoborneols and borneols by heating with acetic acid and a little concentrated sulphuric acid below 50°C and then saponified the resulting ester with production of borneol and isoborneol.

The oxidation of borneol is covered by numerous patents, such usual agents as air, oxygen, ozone, chlorine, nitric acid, potassium permanganate etc. being used. By treating camphene with ozone Richardson and Northern converted camphene directly into camphor with a yield of 80 per cent. of theory.

In the other process Pinene (or turpentine oil) is heated at 100°C. for thirty-six hours with acetic acid, when borneol acetate is obtained. This on saponifying yields borneol, and isoborneol, which are then converted into camphor by oxidation as before.

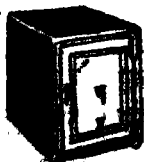
The yield is bad by this method; such products as limonene, dipentene, and others are generated from the pinene. Hence, although the method is extraordinary simple, the methods comprised under first process still hold the field.

The above is the skeleton of the two processes. No detail of the processes is available as it has been kept secret by the manufacturers.

BORNEOL

514 T. K. S. N., Negapatam—Wants to know the process of preparing borneol.

SODA WATER

526 M. S. H. S., Rangoon—Wants to have a formula of soda water.

In making soda and Seltzer waters the required proportion of the salt should be dissolved in a quantity of water and this solution added to the bulk. The mixture is then well agitated. Slate tanks are used when the volumes of solutions dealt with are large. The proportions here adopted are per 10 oz. bottle :—

Soda :

Sodium bicarbonate,	5	grains.

Seltzer :

Seltzer powder,	5 to 10	"

Lithia :

Lithium carbonate,	5	"

If sodium bicarbonate of good quality is used it may be added direct to the filtered water. In the case of lithia water, fine crystals of lithium carbonate should be employed; it may then be dissolved in a small quantity of water and the solution filtered into the right quantity of filtered water. It is also of utmost importance that before bottling proceeds the whole contents of the tanks are so agitated as to ensure a uniform solution.

After bottling these are charged with carbonic acid gas in the usual manner by means of Aerated water machine.

WORM LOZENGES OR TABLETS

582 B. M. D., Howrah—Wants to have a recipe of worm lozenges or tablets.

Santonine	1	oz.
Calomel	1	"
Pulv. Jalap	1	"
Pulv. Saccharin	1	"
Essence of vanilla	2	dr.
Mucilage		q.s.

Mix, granulate and then compress into tablets of 3 gr., 5 gr. and 7 gr. each.

Dose : Children under three years, 3 gr.; three to six years, 5 gr.; over six years 7 grains.

SOLID METHYLATED SPIRIT

599 S. R. M., Pilibhit—Wants to know a formula of preparing solid methylated spirit.

Methylated spirit	1000	c.c.
Stearic acid	60	grm.
Caustic soda	13.5	"

Dissolve the stearic acid in 500 c.c. of the spirit. Dissolve the caustic soda in the remaining 500 c.c. of the spirit. Warm each solution to 60°C. Mix them and pour into suitable containers which have previously been warmed to 60°C. and allow to solidify. The mixture may be coloured, if desired by the addition of suitable colouring material

LUMINESCENT PAINTS FOR CLOCKS AND WATCHES

616 S. B., Calcutta—Desires to have a process preparing luminescent paints for clocks and watches.

A newer luminous pigment is generally based on zinc sulphide.

For this purpose pure zinc sulphide is activated with a very small percentage of a copper compound. The luminescent zinc sulphide with particles given off by radio-active substances are the most efficient of all luminous materials. These are the paints used on watch and instrument dials.

The vehicle required for the purpose is spirit varnish, such as dammar, a plasticized chlorinated rubber varnish, a synthetic resin such as styrol, cyclohexanol, etc. It is important that the vehicle be free from acids which seriously poison the pigment. Phosphorescent paints and coating require to be dried on exposure to sun-light to become active. The shorter the wave-length of the activating light, the greater the degree of luminescence. Ultra violet lamps (black light) are very efficient for this purpose.

SCENTED BETELNUT CHIPS

Betelnuts chips	100	tolas.
Catechu	10	"
Cloves	10	"
Nutmeg	20	"
Cardamom (minor)	20	"
Cinnamon	2½	"
Cubeb	10	"
Mace	10	"
Saffron	small	quantity
Musk	"	"

Powder the ingredients except the first and mix well with the betelnut chips. Perfume with rose oil together with a little peppermint and put in tin pots. It makes a good and medicated preparation for pan or tambool.

BOTTLE-CAPPING SOLUTION

607 R. K. M., Kanpur—Wishes to know a process of bottle-capping solution.

Gelatine, cut small	500	parts.
Gum acacia	100	"
Salicylic acid	4	"
Water	1400	"
Starch	200	"
Aniline dyestuffs		q.s.

Heat the gelatin, gum acacia and salicylic acid with 1000 parts of water. Strain, add the starch and remainder of the water as well as the

dye. For use, warm the paste and dip the neck of the bottle in the paste.

GALVANISING SMALL IRON ARTICLES

508 B. M., Peshawar—Desires to know a process of galvanising small iron articles.

The article to be galvanized is first cleansed with dilute hydrochloric acid, next rinsed off, then placed in a solution of zinc chloride or sulphate, and connected with the negative pole of a dynamo-machine. Zinc plates connected with the positive pole are suspended in the fluid and the machine is set to work. The surface of zinc produced in this manner is provided with a metallic lustre by quickly moving the articles over a fire, or placing them in a chamber sufficiently hot to melt the zinc. If at the instant that this takes place, a stock is given to the articles, the coating will assume the spangled appearance so much sought after.

DISINFECTING FLUID

630 M. L. B., Calcutta—Wants to know good formula of disinfecting fluid.

Coal-tar distillate (of sp. gr. exceeding 1.00)	100	parts.
Rosin	85	"
Caustic soda lye (30°Be)	60	"
Vegetable oil	20	"
Water	200	"

Liquefy the rosin by the application of gentle heat. Pour in the vegetable oil (castor oil, til oil, coconut oil, etc.). Now raise the temperature of the mixture to about 100°C and stir in the caustic soda lye. Boil until saponified. Add water from time to time to make the loss due to evaporation. Then make the soap solution by adding water little at a time until the whole water has been used up. Allow the solution to cool ; when cold add the measured amount of creosote by continual stirring.

RUBBER SOLUTION

654 P. F. S. C., Calcutta—Wishes to have a good process of preparing rubber solution.

Rubber solution is used in some quantity by the cycle and motor tyre repairer and also in various trades as a waterproof varnish. In order to prepare this article fresh raw rubber cut in small pieces is placed in a bottle of naphtha or benzine in the proportion of 1 part of the former to 5 of the latter. The rubber gradually swells absorbing the solvent and eventually loses its tenacity. Now the mass on vigorously stirring or the bottle on shaking at a certain stage and this treatment repeated from time to time, an apparently homogeneous solution is finally obtained. This rubber solution is very sticky and tenacious. But if the raw rubber is not fresh it is better to masticate it in a kneading machine whereby it is reduced to impalpable paste. Now take one part of this paste and put it into 5 parts of naphtha or benzine contained in a suitable bottle. Shake for a while. The rubber readily goes into solution into a less viscous mass than untreated rubber.

BALDNESS CURE

707 J. S., Ludhiana—Wishes to have good recipes for baldness cure and hair tonic for falling hair.

Resorcin	5	parts.
Tincture of capsicum	15	"
Castor oil	10	"
Alcohol	100	"
Oil of roses		q.s.

Mix. Apply after the scalp has been thoroughly cleansed by the shampoo.

HAIR TONIC FOR FALLING HAIR.

Jaborandi Tincture	1000	parts.
Rectified spirit, 95 p.c.	700	"
Distilled water	800	"
Glycerine	150	"
Essence of rose	100	"
Caramel		q.s.

Mix in the order given in the recipe. Keep aside for a week well-stoppered.

Jaborandi tincture as referred above may be prepared from jaborandi leaves, 200 parts, rectified spirit 700 parts; and distilled water 300 parts. After digesting for a week, squeeze out the leaves and filter the liquid.

MARKING INK

732 S.V., Lucknow—Wants to know a good formula of marking ink.

Copper sulphate	20	oz.
Aniline hydrochloride	30	"
Dextrin	10	"
Glycerin	5	"
Water		q. s.

First mix dry ingredients and then mix in glycerin and just enough water to make a smooth paste of proper consistency for use with a fine brush.

WOOL BLEACHING

743 M.S., Bombay—Wants to have a good formula of bleaching wool.

To bleach wool dip it in a solution of hydrogen peroxide (3 per cent.), to which has been added for every gallon of peroxide 0.2 gallon of ammonia (sp. gr. 0.9010). The solution is left at room temperature for 24 hours. By raising the temperature to 86°F., the bleach will proceed more rapidly and will be finished in 8 to 10 hours.

Although the foregoing process is one of the more expensive, it is often used where a more permanent white is desired.

POLISHING NUT BUTTONS

To polish nut buttons, put them in revolving or polishing drum containing pumice and other abrasive materials. When the barrel

containing the materials is rotating whereby some sort of friction is produced over the surface of the buttons. After about an hour take out the buttons which have a high lustre now. Now the buttons may be further polished by means of buffing, hand polishing, or automatic and machine polishing.

BATTERY SEPARATORS

866 *P.E., New Delhi—Desires to know a* good process of making battery separators.

A battery separator is a thin sheet made of wood, ebonite, or glass interposed between the positive and the negative plates of an acid storage battery in order to prevent the plates from touching each other during handling and use, but at the same time allowing the ionic exchange to take place in the electrolyte.

At present the battery separators are mainly made of wood, i.e., cedar, haldu, cypruss, champak, and talauma phellocacarpa. For this purpose the timber is first converted into planks, which should then be seasoned to at least 20 per cent. moisture content, otherwise these sheets of green wood when exposed to the atmosphere, may develop surface and end-cracks. Logs intended for this purpose should preferably be quarter sawn into planks, which should be stacked for air seasoning under shade. If the separators are to be made from peeled veneers, the sheets of veneers should be air-seasoned for a short time before manufacture.

The separators after manufature are given a chemical treatment to remove all volatile acids and to get rid of tannins and resinous matter as far as possible. The treatment consists in boiling the separators in 1 per cent. aqueous solution of caustic soda for 2 hours, followed by one hour's boiling in distilled water, with an intermediate washing to remove the colouring matter sticking to the separators. Lastly, the separators are thoroughly washed with the water till no trace of alkali is left. These are then drained and superficially dried by interposing a blotting paper and pressing under a hand press. The separators are then given a slip in a bath glycerine to which has been added a small amount of an antiseptic (2 parts Rosha grass oil and 1 part thymol) at 105° to 110°C for about 15-20 minutes. The separators, after draining off the glycerine, are washed in running water for a few minutes and stored while wet by wrapping in waxed paper. But for this glycerine treatment the separators are liable to warp and crack on drying.

HINGULA

913 H.S., Amritsar—Wants to have formulas and processes of making hingul or cinnabar.

Hingula or sinjraph is red sulphide of mercury. It may be prepared as follows:—

Take of mercury and sulphur equal parts, rub together with the juice of the red buds of Ficus Bengalensis for three days successively, introduce the mixture within a bottle and heat it in a sand-bath for 12 hours. A red deposit will adhere below the neck of the bottle. It is taken out in the shape of dark red shining scales. The black sulphide prepared by rubbing together equal parts of sulphur and mercury *till the globules disappear is called Kajjali.* The red sulphide is called Hingula.

LUMINOUS PAINT

957 R.U., Gudur—Desires to know the formulas of luminous paints.

I

Strontium carbonate	100	parts by weight.
Sulphur	100	„ „
Potassium Chloride	0.5	„ „
Sodium Chloride	0.5	„ „
Manganese Chloride	0.4	„ „

The materials are heated for three-quarters of an hour to one hour, to about 2.372°F. The product gives a violet light.

II

Calcium oxide (burnt lime) free from iron	20	parts by weight.
Sulphur	6	„ „
Starch	2	„ „
Bismuth nitrate	0.5%	solution „
Potassium chloride	0.15	parts by „
Sodium chloride	0.15	„ „

The materials are mixed, dried, and heated to 1,300°C. (2.372°F). The product gives a violet light.

To make these phosphorescent substances effective, they are exposed for a time to direct sunlight; or a mercury in lamp may be used. Powerful incandescent gas light also does well, but requires more time.

CAT GUT

1077 R.A., Montgomery—Wants to know a process of making Cat Gut.

The guts, taken whilst warm from the animal, are thoroughly cleaned, freed from adherent fat, and well rinsed in pure water. They are next soaked for about 2 days in water, after which they are laid on a table and scraped with a copper-plate, having a semicircular notch, beginning the operation at the smaller end. In this way the mucous and peritoneal membranes are removed. The guts are then put into fresh water, and soaked until the next day, when they are again scraped, the larger ends cut off, and after well washing, again steeped for a night in fresh water, and then for 2 or 3 hours in a weak lye of pearlash or potash (2 oz. to the gall.). They are lastly washed in clean water, and passed through a polished hole in a piece of brass to smooth and equalise their surface; after which they are twisted, and sorted, according to the purposes for which they are intended. For many purposes the prepared gut is dyed or sulphured, and rubbed with olive oil. It improves by age. Red or black ink, or any of the simple dyes or stains, are used to colour it.

—BRIEF QUERIES AND REPLIES

Questions of any kind within the scope of Industry are invited. Enquiries or replies from our experts will be published free of charge in serial order. Questions are replied by post on receipt of As. 8 stamps for each question. Subscribers outside India are requested to send two International Reply coupons for each question. In order to facilitate the work of Editor's Department and to help prompt action the readers are requested to send enquiries in separate letters.

3195 S.R.S.I., Bobbili—You better consult an expert for manufacturing glass bangles and beads.

3198 M.R.F.R.M., Raipur—Asafoetida is a natural product obtained from juice of certain plants grown in Afghanistan. You may adulterate this by mixing potato starch, pulse paste, etc.

3199 O.P.S., Delhi—To clarify castor oil mix 100 parts of the oil with a mixture of 1 part of alcohol (96 per cent.) and 1 part of sulphuric acid. Allow to settle for 24 hours and then carefully decant from the precipitate. Now wash with warm water boiling for ½ hour, allow to settle for 24 hours in well closed vessel, after which time the purified oil may be taken off. An article on synthetic adhesives appeared in December, 1949, issue of Industry. If you go through the article you will get detail information on synthetic resin.

3204 A.R.M.M.C., Nachiapuram — Your query is not in our line.

3205 K.T.C., Ajmer—Following is a list of musical instrument manufacturers: N. B. Sen & Bros., 11, Esplanade East, Calcutta; Dwarkin & Son Ltd., 11, Esplanade East, Calcutta; T. E. Bevan & Co., Ltd., 21, Old Court House Street, Calcutta; R. N. Bhargava & Co., 1568 Cherkhewalan, Delhi and James & Co., Navsari Bldg., Hornby Road, Fort, Bombay.

3206 H. B. Bombay—For cotton ginning machine enquire of W. H. Brady & Co., Ltd., Church Gate Street, Fort, Bombay.

3207 P.C.I., Pampady—We have no book on sugar industry. You may however consult Sugar Industry in India by S. M. Hadi to be had of Thacker Spink & Co. (1933), Ltd., 3, Esplanade East, Calcutta. Sugar making machine may be had of Berry Bros., 15, Netaji Subhas Road, Calcutta.

3208 G.D.No., Amritsar—For selling hides and skins you may negotiate with A. Forbes & Co., Ltd., 60 Chingribata Road, Tangra; Calcutta Hide & Wool Export Co., 35, Chattawalla Lane and Md: Auriff Khan Bros., 31, Harinbari Lane; all of Calcutta. You may write to Indian Trade Commissioner, India House, Aldwych, London, W.C.2.

3209 R.K.M., Belgaum—You may melt rosin and mix with wax. Proportion should be 1 part rosin to 10 parts beeswax.

3210 G. R.S., Bombay—Process of silver-plating and gold plating on glass sheets will appear in Formula section in due course.

3211 K.T., Boroda—Process of manufacturing red enamel will appear in Formula section in due course.

3212 R.V.S., Kathor—We are not aware of any chemical known as naphthazoline. This may be some proprietary preparation.

3213 M.T.C., Imphal—For cigarettes of required brand enquire of Mohammed Yusuf, 59, Canning Street; S. N. Ahmad, 60, Canning St., and G. V. Cigarettes & Co., 41, Mission Row; all of Calcutta.

3214 M.S.G.S.C., Amritsar—For machines you may enquire of Francis Klein & Co., Ltd., 1, Royal Exchange Place, Calcutta.

3215 R.C.M., Bangalore City—You may write to Directors of Industries of various provinces which is situated in the head quarter of the provinces. Formulas of depilatory powder and paste and tooth powder, etc. will appear in Formula section in due course.

3223 D.J.S., Bikaner—To obtain khoa as white as possible, and possessed of the best flavour not more than half a seer of milk should be boiled at a time. All the time the milk is boiling it should be stirred with a wooden rod. Some prefer to stir with a number of rods. A strong and steady heat should be applied. Tamarind wood is considered the best fuel for this purpose. When the milk has got thickened, it is stirred briskly with a wooden spatula and allowed to cool. It is finished up in the form of small balls or pats.

3224 B.K.B., Morena—[illegible] brush enquire of Jai Bharat Brush Co., 29o, Sopribaug Road, Parel, Bombay; Aryan Brush Co., Naigaum Cross Road, Dadar, Bombay and Amherst Brush Factory, 12B, Amherst Street, Calcutta.

3225 A.R.C.A., Karaikudi—Shellac is manufactured from sticklac. Shellac is manufactured by Angelo Bros., 6, Lyons Range, Calcutta; Tollygunge Shellac Factory, Hathibari, Tollygunge, Calcutta and A. M. Arathoon Ltd., 11,

Stephen House, Dalhousie Square, Calcutta.

3226 M.C., Neemuch—Citrous lemon is used in manufacturing citric acid. This variety of lemon grows abundantly in Assam, C. P. and Madras. *Process of manufacturing battery cell will be found in Manufacture of Batteries published from this office, price Rs. 3-7 including postage.*

3228 I.C.I., Ajmer—For ink stands and glass bottles enquire of Bengal Glass Factory, Khengrapatty Street; Burma Glass Works, 9, Ezra Street and Calcutta Glass & Silicate Works, 9, Kundu Lane; all of Calcutta.

3229 K.C.P., Sambalpur—You may negotiate with the Registrar, Calcutta University, College Street, Calcutta for particulars regarding journalism course.

3230 M.S., Lahore—5 lbs. of dyestuff rubbed up with 25 lbs. of glycerine and then dissolving by heating to 190°F. All the dyes should not be used together.

3231 S.M.P., Ganjam—For marble statue you may enquire of Bholanath & Sons, Drummond Road, Agra and Rising Sun & Co., Kishanpole, Bazar, Jaipur City.

3232 O.P., Kanpur—For the chemical required enquire of Alfred Herbert (India), Ltd., 13-3, Strand Road, Calcutta.

3233 S.V.R., Bangalore—Process of manufacturing phenyle, varnish and benzoin will appear in Formula section in due course.

3234 B.V.S., Chintamani—Benzoin is a balsamic resinous exudation from styrax Benzoin. Dryander, and other species of the N. O. Styraceæ, trees native to Siam, Sumatra and Java. The method of collecting benzoin is pieces of bark of rectangular shape are loosened and the resin runs out of the inner side of the bark, solidifying there by the heat of the sun. This forms the finest quality.

3235 P.K.N., Thuckalay—Ink tablet making machines my be had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta. All other ingredients may be had of Banshidhar Dutt, 126, Khengrapatty, Calcutta.

3236 N.R.C., Coimbatore—Address of Bhattacharyya Rubber Works is 174, Jessore Road, Dum Dum; address of United Rubber Works Ltd., is 51, Tangra Road, Calcutta, address of Bharat Rubber Works is B. T. Road, Kamarhati; address of Premier Rubber Works is 92, Narkeldanga Main Road, Calcutta. For rubber hose and belting enquire of Leyland & Birmingham Rubber Co., Ltd., 12, Mission Row, Calcutta.

3246 S.G.B.I., Beawar—We have no book on nut button manufacture.

3247 J.C.S., Mo cluskiegunge—Toys may be had of Sat Couri Dass & Co., 198, Old China Bazar Street, Calcutta; Victoria Toy Emporium, D/65/66/ Sir Stuart Hogg Market, Calcutta and S. H. Abdul Aziz Abdul Khaliq Toy House, 44, 45, 46, Canning Street, Calcutta. Stationery goods may be had of Hazra & Chowdhury Co., 163-64, Old China Bazar Street; International Stationery Stores, 57, Radha Bazar Street, and J. N. Chunder & Bros., 14/2, Old China Bazar Street; all of Calcutta. Following is a list of sporting goods manufacturers: B. S. Kwatra & Co., Basti Sheikh, Jullundur; P. D. Singh & Co, Basti Nau, Jullundur and Pioneer Sports Ltd., Jullundur, E. Punjab.

3248 S.K.R., Salem—In order to prepare chicory cut into slices the fresh root of wild succory or cichorium intuieus and expose it to heat in iron cylinders, along with about 1½ p.c. to 2 p.c. lard. Stir the slices frequently with ladle and remove them when they have been sufficiently fried. Now allow the slices to cool and afterwards grind them into power in a mill. The addition of 1 part of good roasted chicory to 10 or 12 parts of coffee form a mixture which yields a beverage of a fuller flavour and of a deeper colour than that furnished by an equal quantity of pure coffee.

3249 S.E.B., Allahabad—Bakelite goods may be had of Bak-O-Brass Ltd., Old Atlas Mill Compound, Reay Road, Mazagaon, Bombay; Bestoline Moulding Co. of India Ltd., Asian Bldg., Ballard Estate, Bombay; India Moulding Co., C-2, Bharat Bhavan, 13 Chittaranjan Avenue, Calcutta and Indian Plastics Co., Asian Bldg., Nichol Road, Ballard Estate, Bombay. For paper tubes enquire of Central Paper Box Factory, Patel Bldg., 260, Nagdevi Street, Bombay and Gogate Paper Box Works, Princess Street, Bombay. Radio sets and accessories may be had of Bombay Motors & Radio Ltd., 33, New Queen's Road, Bombay and Chicago Telephone & Radio Co. Ltd., 127, Mahatma Gandhi Road, Post Box No. 1312, Bombay.

3250 J.K.S., Mussoorie—Formulas of match head composition and surface composition appeared in May, 1948 issue of Industry.

3251 L.R., Vijayawada—Creosote oil may be had of Bengal Chemical & Pharmaceutical Works Ltd., 164, Manicktala Main Rd., Calcutta; Turner Morrison & Co., 6, Lyons Range, Calcutta and H. Momtaz & Co., 1, Colootola St., Calcutta.

3252 E.H.M., Bombay — Addresses of hosiery manufacturers and commission agents will be found in Industry Year Book & Directory published from this office price Rs. 16-4 including postage.

3253 S.C.G., Kanpur—Process of washing woollen cloth will appear in Formula section in due course.

3255 A.G.C., Gisumu—Following is the process of manufacturing vinegar. Take 10 seers of sugar cane juice in an earthenware vessel and bring to a boil. Remove when it bubbles up and strain when cool. Put it into an earthen ware vessel. Cover the mouth and bury the same in the ground. The hole should be dug big enough to hide the vessel up to the neck. After some days a film will appear, remove it and cover again. Repeat in this way so long as films are formed. Lastly when this ceases, strain and bottle.

3262 R.S.P., Calcutta — Process of manufacturing graphite electrodes will appear in Formula section in due course.

3263 U.K.W., Calcutta—Process of making transfer label will appear in Formula section in due course.

3264 A.A., Delhi—In place of gum arabic you may use ordinary gum available in the market. Raw khand can not be used in place of sugar.

3265 B.N.M., Calcutta—You may start ink manufacture, office paste manufacture, etc. with Rs 1000 as initial capital.

3266 M.B.M., Multan City.—Following is a list of transfer manufacturers: British Kanmagraph Tranfers Ltd., 8, Lower Ormand Street Oxford Road, Manchester; British Transfer Printing Co. Ltd., Quinton Road, Coventry and Eagle Transfer Ltd.; Alcester Street, Deriterned, Birmingham 12.

3270 P.G.M., Karimganj — For cleaning clotted hair you should treat the hair with oil and comb regularly. For agents' address write direct to Polson Ltd., 65B, Dockyard Road, Mazagaon, Bombay—10.

3271 M P K S N, Gokak City—We do not understand what you mean by nilagirol and nilagiri oil. You perhaps mean eucalyptus oil. Following is a list of eucalyptus oil manufacturers:—Aronda Chemical Works, Bombay 4; Coonoor Eucalyptus Oil Distillery, Coonoor; Eastern Aromatics, 105, Hindu Colony, Dadar, Bombay 14 and Kotagiri (Nilgiris) Eucalyptus Oil Distilleries, Fernhill, Nilgiris.

3272 H. S M. C Gulbarga—We sell only our own publications. The books you require may be had of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta; W. Newman & Co. Ltd., 3 & 4, Old Court House Street, Calcutta.

3273 S. K. R., Salem—Wants to be put in touch with the suppliers of Chicory on large quantity.

3274 J. M. B., Bilimora—Process of manufacturing gur appeared in February 1949 issue of Industry.

3275 K. S. W., Ajmer—You may use ordinary starch available in the market. Agar agar is known as china grass.

3276 S. K. M., Bombay—We have no book on fire and marine insurance. You may enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East; W. Newman & Co. Ltd., 3 & 4, Old Court House Street; both of Calcutta.

3277 N. P. C., Karur—Retreading rubber tyres is to repair a damaged tyre perfectly so that it can be again used, it will not do simply to patch the injured part, it must also be vulcanised. The object of vulcanising consists simply in making the rubber solution placed on the tyre elastic, this being done by subjecting it to heat at temperature between 150° and 160°. At this degree of heat the rubber solution loses its original adhesive property, and in order to carry out the process of vulcanising successfully this heat must be maintained at full efficiency. Hitherto this was associated with considerable difficulties on account of the fact that solid fuel was used, but the use of steam in place of solid fuel brought about a great improvement. The tension necessary, in order to maintain the temperature required, is about 4 atmospheres. The use of steam, however, rendered the employment of a large boiler necessary, as a certain quantity of steam had to be stored so as to be at hand at all times when required.

3278 R. L. W., Sivakasi—Process of manufacturing varnished paper will appear in Formula Section in due course.

3289 S. O. S. C. N., Jubbulpore—Soap manufactured by cold process sweats. In order to prevent sweating you should at least manufacture the soap by semi-boiling process.

3290 J K. R., Amritsar—In manufacturing tailor's chalk you may use only china clay in place of pipe clay. Secret lies in stamping with pressure.

3291 S. M. M., Saurashtra—Envelop and tag making machines may be had of Oriental Machinery Supplying Agency Ltd., R12, Mission Row Extension, Calcutta.

3292 G. I. W., Colombo—Printed tin cans may be had of Bengal Tin Box Mfg. Co. Ltd., 1, Jadu Nath Mitter Lane, Calcutta and National Sheet and Metal Works Ltd., 36A, Sahitya Parishad Street, Calcutta.

3293 C. L., Palakol- Process of manufacturing asavas and arishtas will appear in Formula section in due course.

3294 D. S., Jubbulpore—For machines you may enquire of Pratartak Commercial Corporation Ltd., 61, Bowbazar Street; H. M. Hussain & Co., 82, Netaji Subhas Road; Minimax Ltd., Mercantile Bldgs., Lall Bazar and Oriental

Machinery Supplying Agency Ltd., P12, Mission Row Extension ; all of Calcutta.

3295 P. S., Boisar—We do not deal in other's publications. You may however consult Manufacture of Toilet Goods published from this office, price Rs. 4/7/- including postage.

3296 S. N. B., Bhagalpur—All the machines you require may be had of Marshall Sons & Co. Ltd., 99, Netaji Subhas Road, Calcutta ; Balmer Lawrie & Co. Ltd., 103, Netaji Subhas Road, Calcutta; and T. E. Thomson & Co., Ltd., 9, Esplanade East, Calcutta.

3297 L. J. C., Wadhwan Camp—We have no book on copper manufacture. Copper is available in mines in India. For books on copper manufacture you may enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta and W. Newman & Co. Ltd., 3 & 4, Old Court House Street, Calcutta.

3298 J. P. D. Bombay—To prepare yeast one small teacupful of beer, one table-spoonful of sugar and one tea-spoonful of flour are mixed together in a strong bottle and soundly corked. It is then thoroughly shaken and left in a warm place. It is ready for use when the mixture froths up on shaking—generally in 24 hours. The various types of rubber scrap to be reclaimed and also the type of product to be made will determine which of several methods shall be used as the manufacturing process. These processes may be enumerated as the following :—Alkali digestion process; water digestion process ; acid process ; open steam process and mechanical process. Detailed process of digestion will be found in Manufacture of Rubber Goods published from this office, price Rs. 3/7/- including postage.

3299 P. C., Calcutta—We are not aware of the address of Olympic Fountain Pen Co. of Bombay.

3300 D. D. S., Uganda—You may start a soap factory with Rs. 10,000 as initial capital. In this connection you may consult Manufacture of Soap, published from this office, price Rs. 4/7/- including postage.

3301 G. S. P., Champaran—Your enquiry is receiving our attention. In the meantime you better consult a mechanical engineer, specialist in oil engine.

3302 S. I. E. L., Vizagapatam—For analysis of eye ointment you may negotiate with Industrial Research Laboratory, 22, R. G. Kar Road and R. V. Briggs & Co. Ltd., 3 & 4, Garstin Place ; both of Calcutta.

3303 L. R. S., Jullundur—For selling extract of acacia (babla) you may negotiate with tanneries. Following is a list of tanneries :—Cawnpore Tannery, Bhananapururva, Kanpur ; Eastern Tanneries Ltd., Kanpur ; Lucknow Chrome Tannery, La Touche Road, Lucknow ; North West Tannery Co., Civil Lines, Kanpur and U. P. Tannery Co. Ltd., Jajmau, Kanpur.

3304 S. B. P., Patna—For selling butter you may negotiate with Chanda's Dairy, Lake Road Market, Ballygunge, Calcutta ; Bajranglall Agarwala & Co., 151, Cotton Street, Calcutta and Sheolall Onkarmull, 21, Cotton Street, Calcutta.

3305 H. C., Amritsar—Collapsible tube filling machines may be had of Industrial Machinery Co., 13, Netaji Subhas Road, Calcutta. Collapsible tubes may be had of Metal Box Co. of India Ltd., B2, Hide Road, Kidderpur, Calcutta. A good recipe of tooth paste appeared in November, 1949 issue of Industry.

3306 P. S., Eluru—Following is a list of China clay dealers :—Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane ; Bengal Supply Co., 23-24, Strand Road; East India Trading Co., Post Box 487 and H. S. Das, 104/1, Serpentine Lane ; all of Calcutta.

3307 S. S., Ranchi—You may refer your query regarding motor mechanism to Automobile Engineering Institute, 33, Rowland Road, Calcutta, and French Motor Car Co. Ltd., 243/3, Lower Circular Road, Calcutta. Regarding City and Guilds examination write to the Secretary, City and Guilds Examination Committee, 7, Council House Street, Calcutta.

3321 R. C. W., Delhi—You should select name of your firm yourself. No such process of stamping steel is available.

3322 K. V. R., Bhimavaram—You may address any letter to the Editor, Industry, 22, R. G. Kar Road, Calcutta.

3325 G. H. P. S., Faizabad—For casein enquire of Scientific Milk Products of India Ltd., 32, Ezra Mansions, 10, Government Place East, Calcutta and Mehta Brothers, 111, Chittaranjan Avenue, Calcutta. Aluminium sulphate may be had of Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta.

3326 C. M. G., Cuddapah—For tin boxes enquire of R. Thandapani Chettiar, Netaji Road, Negapatam and Rathnam Industrial Works, 38, Murugappa Mudali Street, Vepery, Madras. Perfumery raw materials may be had of Barai Bros., 20-3, Govindappa Naick Street, G. T., Madras and Kangundi Industrial Works, Kuppam, Chittoor.

3327 S. N. A., Sind—Roghan is prepared from oil of wild safflower. The oil is boiled continuously for 12 hours. The oil being cooked to the required extent, and while still boiling

..., it is thrown into large shallow trays containing cold water. It swells up into a jelly-like substance, which is called roghan.

3338 B. A. A., Chapra—You should advertise in newspapers and periodicals announcing your business; you may also send circular letters to reputed commercial houses offering your service.

3339 N. C. C. S., Ahmedabad—Red lead may be had of Koylash Chandra Dutt, 20, Bonfield Lane, Calcutta. Other ingredients may be had of Banshidhar Dutt, 126, Khengrapatty Street Calcutta.

3346 B.T., Bombay—Thread ball making machine may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

3347 K.B., Bombay—It is not possible to dissolve mica.

3348 R. K. N., Lucknow — Address of Australian Government Trade Commissioner is 2, Fairlie Place, Calcutta and the address of Swiss Trade Commissioner for India, Burma and Ceylon is Gresham Assurance House, Sir Pherozshah Mehta Road, Bombay. Trade Commissioners of Japan and Germany have not yet opened office in India.

3349 S.E.C., Ahmedabad- You may consult Practical Metal Casting by D. Dey, published from this office, price Rs. 3/7/- including postage.

3350 M.A.C.S., Nigeria — One of your enquiries has been published in Trade Enquiry Columns. Other enquiry is in the nature of an advertisement and cannot be published free of charge.

3352 S.K.U., Calcutta — You may start lozenge, soap and mustard oil manufacture. Of these mustard oil industry will be suitable for you. You may use country ghanny run by bullock. If you can secure power you may erect several pair of ghannies that will be run by motor.

3353 P.V.N.R., Vizianagram — Pour the jaggery in centrifugal machine and run the machine when crystals in the jaggery will stick to the wall of the machine which should be scraped and dried in the sun.

3354 V.R.J., Tinnevelly—For match sticks and boxes enquire of Brilliant Match Works, Sivakasi, Ramnad. For match chemicals enquire of Dawn & Co., 11, Portuguese Church Street, Calcutta and Calcutta Chemical Co. Ltd., 10, Bonfield Lane, Calcutta.

3355 S.B., Simla—For machines required for plastic goods manufacture enquire of Francis Klein & Co. Ltd., 1, Royal Exchange Place and Alfred Herbert (India) Ltd., 13/3, Strand Road; both of Calcutta.

3356 N.A., Madras—Asafoetida is extracted from a species of herb which is found wild in Eastern Persia, Kharsan and other localities. It prefers a stony arid soil and is found at an altitude of 7000 ft. Hing is obtained by wounding the upper part of the root, from which a small quantity of gum escapes and collected. The living root is then sliced daily or every two or three days, with the exudation adhering to it, till exhausted. Whole mass consisting of alternate layers of root and gum resin is packed in skin. As found in the market, the resin consists of blackish brown brittle mass of extremely fetid odour, always mixed with slices of the root.

3357 E.C.I., Ludhiana—For creosote oil you may enquire of Turner Morrison & Co., 6, Lyons Range, Calcutta and Jardine Henderson Ltd., 4, Clive Row, Calcutta.

3358 U.N.S.C., Nowgong—Following is a list of newspapers:—Times of Ceylon, Colombo; Ceylon Observer, Colombo; Burma, 213, Mogul Street, Rangoon; New Times of Burma, 401, Dalhousie Street, Rangoon; Sun, 65, Frere Street, Rangoon; Daily Mirror, Bunder Road, Karachi; East Bengal Times, East Bengal Times Press, Wari, Dacca; Eastern Times, Paisa Akhbar Street, Lahore and Inqilab, Khalsa Street, Railway Road, Lahore.

3359 K.B., Ajmer—Process of manufacturing crayons will be found in Prospective Industries, published from this office, price Rs. 3/7/- including postage. For moulds write to Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta.

3360 S.S., Muradabad — Following is the process of manufacturing iron or steel slate. The artificial slate coating on iron or steel consists of a mixture of finely ground slate, lampblack, and a water glass solution of equal parts of carbonate of potash and soda silicate. First prepare the silicate solution by finely crushing equal parts of carbonate of potash and soda silicate and pouring over this 6 to 8 times the quantity of soft water, which is kept boiling about 1½ hours whereby the silicate is completely dissolved. Add 7 parts of finely crushed slate finely ground with a little water into impalpable dust, 1 part lamp black, which is ground with it, and grind enough of this mass with the previously prepared silicate solution. With this compound the rough form of steel plates are painted as uniformly as possible. Keep aside the painted plates for week. Then put into a saturated solution of calcium chloride and wash with clear water.

3361 M.C., Meerut—You may consult Delhi Market, Hauz Qazi, Delhi and Industrial India, Chandni Chowk, Delhi. We have no such book. Process of manufacturing luminous paint and etching plastic sheet will appear in formula Section in due course.

3362 S.M.K., Jodhpur—We have no book on wool weaving. You may enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta.

3363 S.K.C.M.W., Sivakasi—For aluminium powder enquire of Aluminium Corporation of India Ltd., 9, Netaji Subhas Road and Indian Aluminium Co. Ltd., 5, Council Street; both of Calcutta.

3364 B.G., Raipur — Snow will produce pearliness on keeping for at least a fortnight.

3372 D.M.L., Gadag—As a sizing material for textiles, it is superior to gum karaya and preferably equal to starch. In consideration of the reasonable price, it can be expected to

become permanent. The sizing material is prepared by heating the seed to 150°C for about 15 minutes soaking of the decorticated kernels in water and drying them for powdering. Instead of the 75 per cent solution employed where tapioca starch is employed a 5 per cent. solution of the tamarind sizing powder can be recommended for correct viscosity and consistency.

3373 R.P.P., Lucknow—For tea enquire of the following firms: A. Tosh & Sons, 11-1, Harrison Road; B. K. Saha & Bros. Ltd., 5, Pollock Street; Eastern Hindusthan Tea Co. Ltd., 22, Canning Street and Orphan Tea Co., 18, Raja Woodmunt Street; all of Calcutta.

3374 R.C.M., Hissar—Following is a formula of ink powder:—Methylene blue 1 oz.; Methylone violet 1 oz.; Dextrine 2 oz.; Boric acid 1 oz. Mix well and make a mass by adding a little water; dry in the sun and break into small granules which when put into a tablet making machine will produce ink tablets.

3375 N.C., Muzaffarnagar — For ice candy making machine enquire of Western Traders Ltd., 15-A-6, Western Extension, Karelbagh, Delhi; Lionell Lillison & Co., 11, Connaught Place, Delhi and Maharaja Lal & Sons, Chandni Chowk, Delhi.

3376 S.M.S.G., Calcutta—You may add 5 to 10 per cent. sulphuric acid to slaughter house refuse when ammonium sulphate will be produced.

3377 S.P.S., Calcutta — For mould and machine for blade and needle making enquire of Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta.

3378 A.T.E., Kalimpong—For addresses of U. K. write to British Trade Commissioner, 1, Harrington Street, Calcutta and for American addresses write to American Trade Commission, 9-10, Esplanade Mansion, Calcutta. For selling other things you should advertise in newspapers.

3379 S.C.S., Amroha—Printing ink factories are mostly situated in Calcutta and Bombay. We are not aware of any printing ink factory in U. P.

3380 J.P.D.P., Faizabad—Mustard oil and ghee flavour may be had of Paradise Perfumery House, 7, Colootola Street and Essence Supply Agency, 6, Colootola Street; both of Calcutta.

3389 S.M., Gorakhpur — You may consult Cotton Dyeing and Printing, published from this office, price Rs. 3/7/- including postage.

6390 K.V.B.P.R., Kistna — You may start cotton tape manufacture with Rs. 1,000/-. Sodawater making mchines and accessories may be had of Essence and Bottle Supply Agency, 14, Radha Bazar Street, Calcutta. Bakery and biscuit making machines may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta. For glass cutters, photo frames etc. enquire of Fotic Lall Seal & Sons Ltd., 10, Swallow Lane; Kanay Lall Dhur, 11, Swallow Lane and Behary Lal Dey, 9, Swallow Lane; all of Calcutta.

3391 C.L., Palakol—You should add alcohol for preserving ayurvedic decoction. Quantity should be 25 per cent., of the decoction.

3392 K.S., Cuddalore—Following is a list of bonemeal manufacturers:—Anderson Dawe & Co., Darabshaw House, Ballard Estate, Bombay; Nanavati & Co. Ltd., 16, Apollo Street, Fort, Bombay; Acme Fertiliser Works, "C" Block, Hide Shed, Kidderpore Docks, Calcutta; Beleghata Bone Mills, 21, Barwaritola Road, Calcutta; Mysore Fertiliser Co., 31-A, North Beach Road, Madras 1 and Presidency Manure Works, Feroke, Malabar. Coconut shell powder may be used as filler. Bones to be used as fertilisers are first sorted and crushd to about 1 inch pieces. They are then extracted with hot solvent, often benzine, to take out the fat and remove some water. The fat and water are run off. The bones then treated are easily ground very finely when these are known as bone meal.

3393 S.R.B.S.F., Bidar—Kaolin may be had of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane, Calcutta.

3394 N.U.R.B., Kakinada — Electroplating equipments and accessories may be had of Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta.

3395 G.S., Kanpur—For liquid gold enquire of Baker Platinum Ltd., 52, High Holborn; London W. C. 1 and Johnson Matthey & Co. Ltd., 73-83, Hatton Garden, London E. C. 1 Process of manufacturing liquid gold will appear in Formula Section in due course.

3396 S.G., Halisahar—A good formula of taral alta appeared in January 1950 issue of Industry. Process of manufacturing soap will be found in Manufacture of Soap published from this office, price Rs. 4/7/- including postage.

3397 S.R.S., Amritsar — For chromium plating enquire of Sen Gupta Electroplating Works, 84, Dharamtala Street, Calcutta and Electro Nickel & Chromium Plating Works, 3E, Kartic Bose Street, Calcutta.

3398 U.M., Bombay—Following is the process of making champa otto:—Put 500 freshly bloomed flowers in a jar and strew over them 15 grs. benzoic acid. Pour 24 oz. sandal oil into it, close up the mouth and place phial in the sun and in dew at night for one month. Finally filter through filter paper. Put in a stoppered phial and place in the sun for a fortnight to clarify.

3399 P.J.R., Pundri—You should first of all advertise in newspapers and appoint some agents and distributors in large towns of India and Pakistan. You should also distribute handbills describing efficacy of the medicines with addresses of local stockists and distributors.

3408 R.K.T., Poona—For iron fillings and aluminium powder enquire of B. K. Dutta & Co. 35, Netaji Subhas Road; Bengal Paint Stores, 61, Netaji Subhas Road and Chandi Charan Nayak, 124-1, Bow Bazar Street, all of Calcutta. Potassium perchlorate may be had of Allied Agency, 16, Bonfield Lane, Calcutta. Process of manufacturing fireworks will be found in Home Industries, published from this office, price Rs. 3/7/- including postage. Sparkler should be dried in hot chamber.

REVIEW OF BOOKS

POURA BIGNAN-O-ARTHANITI (Elements of Civics and Political Economy in Bengali) by Sri Harishadhan Chattopadhayaya. Published by Chatterjee Publishers, 8/1B, Shyama Charan De Street, Calcutta. Pages, 96 + 156, price, Rs. 6/-.

It is just one of the few efforts which have been made in recent years to put out text-books on Civics and Economics in the Bengali language. The author expresses the hope in an introductory note, that this Bengali version of his original book in English would help students understand the subject in a better manner. The style of writing however seems to be a bit stiff. The author will do well to improve it in the next edition.

THE INDUSTRIAL REVOLUTION (1760-1830) by T. S. Ashton. Published by Oxford University Press, Calcutta address :—Mercantile Building, Lalbazar. Pages, 168, price, 5s. net.

This is a valuable addition to the famous Home University Library series of the Oxford University Press. The work is a detailed study of the economic progress of the British people under the impetus of the Industrial Revolution during the year 1760-1830. The author is equally interested in the intellectual and technical aspects of the movement. Laying emphasis on the intellectual aspects of the movement Prof. Ashton writes, "The conjuncture of growing supplies of land, labour, and, capital made possible the expansion of industry; coal and steam provided the fuel and power for large-scale manufacture: low rates of interest, rising prices, and high expectations of profit offered the incentive. But behind and beyond these material and economic factors lay something more. Trade with foreign parts had widened men's views of the world, and science their conception of the universe : the industrial revolution was also a revolution of ideas. If it registered an advance in understanding of, and control over Nature, it also saw the beginning of a new attitude to the problems of human society."

Excluding the Introduction which is an eminently readable survey of the general trends of the movement both in material and mental sphere, there are five other chapters in the book dealing with the earlier forms of industry, technical innovations, problems of capital and labour, individualism and laissez faire, and the course of economic change the Industrial Revolution had charted out.

The Industrial Revolution certainly meant a certain amount of mechanization of civilization, but most writers not in favour of it have simply overdramatized its baneful effects. All things considered, the movement has done more good than harm and opened out the path to progress for mankind. If on occasions man has abused the machine, the fault is exclusively his. Certainly the passive, instrument cannot be blamed for the wrongs of the agent. Commenting upon an historian's references to "the disasters of the industrial revolution" Prof. Ashton rightly says, "If by this he means that the years 1760-1830 were darkened by wars and made cheerless by dearth, no objection can be made to the phrase. But if he means that the technical and economic changes were themselves the source of calamity the opinion is surely perverse."

NEW PATHS FOR JAPAN by Harold Wakefield. Published by The Royal Institute of International Affairs, London. Pages, 224, price, 15-s net.

There is nothing propagandist about the book which is a factual anecdote of Japan's sensational rise as an imperialist power only to be followed by rapid decay. The work opens with an Introduction by Sir Paul Butler, in the course of which he pleads for war-ravaged Japan's restoration to a place of respect in international society.

The book under notice here is divided into two parts. Part I is a detailed review of how Japan emerged as a modern industrialized country. Part II deals with the war years and the post-war period.

Pre-war Japan's rise to eminence as the most prosperous nation in the east was undoubtedly sensational. But her prosperity was short-lived due to her own imperialist greed. The author, however, shows perfect freedom from bias and animosity in recounting this story of Japan's rise. Instead of spitting venom the author presents a factual record of Japan's achievements in the various fields, political, economic and social. Japan was the first Asian nation to profit by occidentalism which she engrafted on her own ancient tradition to her best possible material advantage. In agriculture as well as in industry she copied the western methods and succeeded in revolutionising her economy almost with the speed of lightning. But she failed to get into the spirit of occidentalism. Instead of following the liberal democratic tradition of the west she pursued the cult of nationalism to its utmost limits and, in that process, developed aggressiveness to which more than to anything else her fall is to be attributed. Part I includes knowledgeable estimates of Japan's per-war economy, population problem and agriculture. The author's attitude to the much-criticised Zaibatsu is not vitiated by condemnation. He thinks that one of the main weaknesses of Japan's economy, both for peace and war, lies in her huge and primitive agriculture. Pre-war Japan was self-sufficient in food, the supplies from her colonies and the Manchurian empire being taken into account. But to-day her food position is far worse than formerly. One of the chief weaknesses of her industry is that she does not produce her requirements in raw materials. With the loss of

Manchuria and other colonies her raw materials situation has become far less hopeful than formerly. Her power resources, in particular hydro-electrical energy, are fairly well-developed.

The present phase, that is, one of occupation opened with Japan's defeat in the war. Part II. gives details which show that the occupation officials are not revengeful in their attitude towards a defeated enemy. Far from it, they are doing their best in guiding the Japanese along the path to democracy and progress.

Part II, opens with an account of Japan at war, her defeat and surrender which came shortly after the fall of Hitler. Some think that Japan could have kept on fighting had the U.S.A. refrained from atom-bombing two of her cities. But the U.S.A. had to use the atom bomb because of Japan's failure to accept the Potsdam terms which amounted to a call for unconditional surrender. Since the surrender politics in Japan do not seem to have whipped up much of a problem and the swing towards democracy and economic progress is quite perceptible. Under Gen. MacArthur's benevolent guidance efforts have been to re-educate the Japs, democratise their constitution, humanize the Mikado, etc. The book also gives details about the trials of war criminals and the economic problems arising out of her defeat in war. The book closes with a plea for fair and sympathetic treatment towards the defeated Japanese people so that they can be weaned away from their past follies, errors and indignities and assured a dignified and honoured position in the democratic world.

HINDU-MUSLIM CULTURAL ACCORD by Dr. Syed Mahmud. Published by Vora & Co., Ltd., 3, Round Building, Bombay 2. Pages, 87, price, Rs. 2-8.

Originally the articles contained in this book appeared in "The Statesman". An attempt has been made by the author to study Hindu-Muslim cultural relations since the advent of the Musalmans in India down to the present day. The book reveals how close cultural relations between the two communities were established in Muslim India. Details of these are given in the work.

Under the British regime, however, Hindu-Muslim unity established previously was undermined. The growth of separatism was evident not only in the political but cultural field. Guided by their imperialist policy of "divide and rule" the British historians sought to play off one community against another by proving that the Muslim period in Indian history was an age of unmitigated oppression from which the British had come to relieve the Hindus. After the formation of the Congress and the growth of nationalism among the English-educated a vast majority of whom were the Hindus, the British modified their tactics and this time transferred their patronage to the Muslim encouraging them to stand aloof from the Hindus. The logical culmination of this was the formation of the league. The rest of this sad tale of Hindu-Muslim bickerings leading to the division of India is too well-known to bear repetition here.

The greatest need to-day is to re-establish Hindu-Muslim amity in all the possible spheres. Under the aegis of the National Government wedded to the principles of secular democracy this task is being carried on with commendable assiduousness. In Pakistan, however, the Government seems to be making a fetish of what it calls "Islamic State". Their anti-Hindu measures to-day have nearly completed the division between the two great communities. In India Hindu-Muslim amity has been restored, but the existence of disruptive forces cannot be denied altogether and in the years to come the people and the Government alike will have to mount guard on them. Real Hindu-Muslim accord will be possible, as in the past, by and through cultural contacts. Political amity often proves short-lived, but cultural and spiritual comradeship is permanent. Mr. Syed Mahmud has rendered an invaluable service to a great cause by stressing the need for reviving the past common heritage of inter-communal amity and by so enriching and embellishing it as to keep abreast of the requirements of the modern age. Or, in other words, we have to go back to the past, revive the past tradition and then carry it forward true to the logic of history.

NOTICES & REVIEWS

(Manufacturers sending specimens and samples of their products for notice and review may please note that no notice is published of medical preparations and allied substances in this sections.)

CALENDAR SUSPENDERS.

We have received from Sree Venkateswara Power Rolling Mills, 201, Rangaswamy Temple Street, Bangalore City, samples of calendar suspenders both in brass and tin.

WATERPROOF INK

We have received from Profile (India), Ltd., P.O. Jadavpur College, 24-Parganas, W. Bengal a phial of white ink to be used by painters and photographers. The product is found to be satisfactory.

NEW YEAR'S CALENDARS.

We have the pleasure to receive new year's calendars from the following:—Raghunath Dutt & Sons Ltd., Bholanath Dham, 33-2, Beadon St., Calcutta 6; Universal Cardboard Box Factory, 54, Ezra Street, Calcutta; Mullick's Nursery & Agricultural Farm, Seed House, Salkia, Howrah; Bengal Scientific & Technical Works, Ltd., P-513, Rash Behari Avenue, Calcutta and S. Antool & Co., Ltd., 91, Upper Circular Road, Calcutta 9.

TRADE ENQUIRIES

(To communicate with any party write to him direct with name and address given below mentioning Industry).

3350 M.A.C. Stores, Motor Road, Mushin Lagos, Nigeria—Want to be put in touch with Indian firms interested in African herbs, roots, animal skins, lion skins, spices, etc.

3457 Mudhusudan & Bros., Upleta, Kathiawar—Want to be put in touch with the importer of pure asafoetida of Kabul, Iran and Kharasan.

Phone : Bank [illegible] Gram : "Korkbag"

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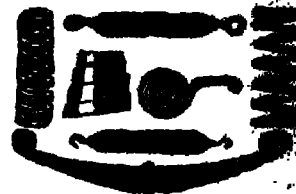
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INDUSTRY PUBLISHERS LTD.
22, R. G. KAR ROAD, CALCUTTA - 4.

Edited, Printed & Published by K. N. Banerjee, for Industry Publishers Ltd., at the "INDUSTRY PRESS" 22, R. G. Kar Road, Calcutta-4.

ILY MAGAZINE FOR MA..FACTURERS & BUSINESSMEN

CALCUTTA, MARCH, 1950. No.

Estd. 1890
SA
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INDUSTRY.

A Monthly Magazine for Manufacturers and Businessmen.

Published in the first week of the month by INDUSTRY PUBLISHERS LTD., 22, R. G. Kar Road, Calcutta-4.

EDITORIAL CONTENTS FOR MARCH, 1950

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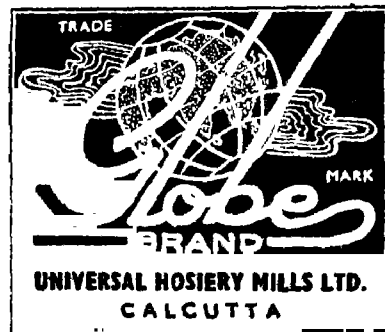
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Industry

. M. Banerjee,
Editor :

VOL. XL. CALCUTTA, MARCH, 1950. No. 480.

THE SARVODAYA PLAN

IN the main, the Sarvodaya Plan published some time ago, is applicable to India's rural economy. The principal stress is on agriculture and allied industries such as animal husbandry. Land reforms, the abolition of Zamindari in particular, are urged. A novel suggestion put forth by the Sarvodaya Committee relates to the creation of a "rural economic civil service" for undertaking the rehabilitation of rural economy with a crusading spirit. Other agricultural reforms suggested, include compulsory scaling down of the farmers' debts and also those of the landless peasants. The evils of employment and under-employment among agricultural labourers can be removed on a planned basis by transferring the bulk of this population to collective farms and agro-industries.

With regard to industrial production the plan envisages manufacture of consumer goods by decentralized industries. Centralized control and production are recommended for defence industries, power generation, mining, metallurgy, forestry, heavy engineering, machinery and machine tools, and chemicals. The Sarvodaya planners want the use of money to be reduced to the irreducible minimum and its substitution in all possible cases by the good old barter system. For the improvement of the villagers' standard of living and for modernising village life, it is suggested that there should be provision for modern amenities like railways, roads, inland waterways, posts and telegraphs, etc. Administrative reforms with Gram Panchayets as the basic units of administration, are recommended.

It is wrong to think that the Sarvodaya planners are dead opposed to the modern mechanised civilization, but certainly they cannot want to be a party to its introduction in India to the detriment of the interests of millions on millions of our rural folk. What they sincerely desire is a harmonious development of our two economies, the urban and the rural. The Sarvodaya Plan, if and when implemented, will go a long way towards demolishing the existing aloof wall of artificiality between our cities and villages.

MANUFACTURE OF LOCOMOTIVES

The Indian Railway Board celebrated the inauguration of the Republic in a very constructive manner. On January, 25, started the passenger train service through Indian territory to Darjeeling and Assam along the new Assam rail link. The goods traffic on this new line opened on Dec. 9 last year. The new railway line is a marvel of modern engineering. First conceived in 1948, the project was completed within a shorter period than earlier anticipated and this shows our excellent capacity to face up to emergencies and deal with them in an effective manner. That there was a real need for establishing a direct rail link between Assam and the rest of the Indian Union is best seen in the context of the obstacles placed by Pakistan to the free movement of goods through East Bengal.

Another event of outstanding importance is the opening of the Locomotive Manufacturing Workshops at Chittaranjan in the Burdwan District of West Bengal. The opening ceremony was performed by Mrs. Basanti Devi, widow of the late Deshbandhu Chittaranjan Das, after whom the new site has been named. On the Republic Day the factory went into production. Immediately now locomotives will not be manufactured, but parts are already being made. The ultimate aim is to turn out 120 locomotives and 50 spare boilers per year.

The project originated in the report of the late Messrs. Humphries and Srinivasan submitted on the eve of World War II. During the war work on the project had to be suspended, but on its termination the scheme was revived. Work was started at a place called Chandmari, but this was abandoned at the time of the partition as Chandmari was too near the Pakistan border.

The new site, Chittaranjan is only about six miles from the proposed Maithon Dam across the Barakar river, from where both water and electricity will be obtainable. The site is very near the coal belt of West Bengal and Bihar, and the Steel producing areas of Tatanagar. For the present electricity will be obtained from an idependent thermal station but later it will be purchased from the Damodar Valley Corporation. Water will be obtained from the nearby Ajoy river.

Along with the workshops a new township is being built. It will accommodate 6,000 families. Already about 42% of the staff quarters have been erected. The projected township will be very modern in character, equipped with electricity, filtered water supply and waterborne sewage.

The workshop will have 1,000 machines to manufacture parts and assemble the locomotives; altogether 10,000 tons of steel work are to be used to house these machines. There will be 100 miles of water pipes and 100 miles of sewer pipe lines; roads will cover a total length of 60 miles. Estimated cost of the project is a little over Rs. 14 crores Rs. 8.5 crores for workshops and ancillaries, and Rs. 5.8 crores for staff colony and welfare works.

STATE PROTECTION FOR INDUSTRIES

The representatives of the Ahmedabad Millowners' Association and the Gujrat Chamber of Commerce told the Fiscal Commission some time ago that the proposed Planning Commission should

determine which industries required state protection and initial assistance, and the order of priorities in which they should be established. It was for the Tariff Board to determine the quantum of the protection or assistance needed by such industries. They also suggested that the Tariff Board might function most appropriately as a wing of the Planning Commission.

The Ahmedabad millowners do not think that there is any need to lay down rigid conditions for protection. The only guiding factor in this regard should be whether the industry concerned is important from the point of view of national defence and security or employment of labour. The main object of protection is to foster the growth of national industries. But any industry which abuses protection loses all claims to it. The Indian sugar industry is a case in point.

Another important suggestion of the Ahmedabad millowners was that all organized industries should establish adequate research organizations with government assistance.

The representatives of the Textile Labour Association said they were not opposed to rationalization provided it did not involve largescale unemployment or additional burden on the workers to the detriment of their health, and provided it could lead to an ultimate reduction of cost to the consumer. They demanded that the aim of the Government's Policy should be to increase production by 75 per cent and reduce the remuneration of the managerial staff so that the workers' wages could be doubled.

DECONTROL OF SUGAR

There are many in this country who think that there is no real shortage of sugar here and that the prevailing scarcity is an artificial one. As a remedial measure they have been demanding decontrol of sugar. There are some who are advising withdrawal of protection and imports of sugar from abroad to force the hidden stocks to come out into the open. There is a third viewpoint that sugar here has really gone scarce and that the only remedy lies in increased production. What exactly the position is, cannot be ascertained without enquiry and we can only hope that the Government will not make any further delay in implementing its promise of an enquiry given to Parliament in December last.

Meanwhile it is interesting to note that Mr. A. Caws the Chairman of the Indian Sugar Producers Association, admitted in a recent speech to the 39th annual meeting of the Association that there was no real sugar shortage in the country. He advised decontrol as he could not take kindly to the idea of Government interference. He said he was confident that ultimately the Government and the industry would co-operate to the mutual benefit of the consumers and producers. If Government interference was at all necessary, Mr. Caws said that there should be established an all-India Control from the Centre. We do not think that it will be advisable to withdraw sugar control right away but certainly Mr. Caws' insistence upon a uniform countrywide system of control from the Centre is considerably reasonable.

FOOD FOR THOUGHT

There is food for thought in Mr. A. N. Khosla's address at the 13th annual meeting of the Institution of the Engineers (India). He expressed his agreement with Pandit Nehru's view that the task of solving India's economic and social problems could be done only by our scientists.

Mr. Khosla is not opposed to seeking foreign aid for the purpose of economic

development, but the importance of self-help should not be undeterred by any means. Addressing the engineers in Patna last month he is reported to have said, "In our impatience to cover in a few years the track of a century and with an overemphasis on our limitations in technical know-how, we are apt to sit back and look to foreign aid. That aid can be no substitute for self-help. What use will it be if foreign specialists and foreign capitalists are dumped in the country when we are not ready to make full use of them? Foreign co-operation is desirable. But we must seek this co-operation on a reciprocal basis and not in the form of benevolent dole to a nation out of work or unwilling to work."

Mr. Khosla does not dispute the need for rapid development, but stresses that we have to regulate the pace to suit our limited resources in men, money and materials. Mr. Khosla rightly holds that industrial development should proceed side by side with resource development. Development of irrigation and power supply facilities rank first for priority. To illustrate how industrial development and resource development are inter-linked, Mr. Khosla said, "——it will be wasteful to produce large blocks of power without at the same time setting up the industry or other load to utilize the power, or to provide irrigation facilities without at the same time preparing the agricultural lands to receive that water."

LIBERALIZATION OF EXPORTS

At the time of writing it is expected that the Government of India may decide upon further liberalization of exports to improve this country's balance of payments position. The export promotion drive of the Government needs to be accelerated and in commercial circles there is a demand for increased exports of cotton piece-goods, jute goods, oil and oilseeds. It is a matter of some satisfaction that for the first time in recent years India had a favourable trade balance of Rs. 8.6 crorers in November, the total value of exports being Rs. 51.06 crores. Now is the opportunity to maintain this improved position and also to find out how best to accelerate it further. We have to prove to the entire satisfaction of our oversea buyers that our goods can compare favourably with other foreign articles both in quality and price. Devaluation has removed the uneconomic price factor which was impeding the promotion of our export trade and to-day we have to improve the quality of our articles of export to make them acceptable to our buyers abroad.

JUTE RPODUCTION

At present vigorous efforts are being made to liquidate India's dependence on the supplies of raw jute from Pakistan. Jute is being grown in the four Jute growing States of West Bengal, Bihar, Orissa and Assam and also in the new areas of Tripura, Cooch Behar, Uttar Pradesh and Travancore.

Presiding over the half-yearly general meeting of the Indian Central Jute Committee in Calcutta last month, Sardar Dattar Singh, the Chairman of the Committee disclosed that the target for Jute production in the coming year is 5 million bales. This quantity is expected to be supplemented by 1 million bales of mesta and other substitute fibres.

Giving figures of production Sardar Dattar Singh said that in the U. P. the area under Jute had gone up from 5,000 to 13,000 acres; Orissa's acreage had increased from 23,000 to 51,000. Next year the U.P. is to have an additional 47,000 and Orissa, 50,000 acres. Assam's addition is expected to run to 100,000

acres. The area under Jute in West Bengal is said to be more than 457,000 acres. Jute grown on an experimental basis in Travancore has been found to be of an excellent quality and it is proposed that 20,000 acres of land will be brought under Jute cultivation in that State. The Chairman of the Central Jute Committee held that proper treatment of seeds, improved methods of cultivation, plant protection, etc., could bring in an additional yield of 200,000 bales of Jute.

At present, quality seeds are being grown through registered growers and on Government demonstration farms. The immediate plan is to start 1200 demonstration farms in Bihar, 500 in Assam, 300 in West Bengal and 200 in Orissa. For the purpose of procurement and distribution of setds to the deficit States, the Central Government have allocated Rs. 4,00,000 and machinery for procurement has started working.

Mesta is now being mixed up with Jute in the Indian Mills and the result has been found to be satisfactory. The acreage under Mesta is proposed to be increased by 100,000 acres and the anticipated production will run to 900,000 bales in the coming year. Other substitute fibres like linseed, sunn hemp, etc. could also be grown to the extent of 100,000 bales, Sardar Dattar Singh disclosed. He also assured the Jute Committee that steps would be taken to provide railway wagons for the transport of raw jute from the producing to the mill areas. The new rail link between Assam and the rest of the Indian Union will facilitate a speedy transport of Jute from Assam and North Bengal.

Due to India's refusal to buy raw jute from Pakistan on account of its enhanced price because of disparity in value between the Indian and the Pakistani Rupee, East Bengal, it is reported, is reducing its Jute acreage. The cross bottom quality which India used to purchase wi be eliminated altogether and efforts wi be made to produce only the better vari tits of Jute. In a desperate search fo customers for her Jute and also for th purpose of procuring the coal she needs s badly Pakistan has had to climb low an withdraw the economic sanctions again the Union of S. Africa much to the detr ment of the interests of the Pakistan living in that country.

NATIONAL PLANNING COMMISSION

The Congress High Command hav made an important recommendation urg ing the Government to establish a Plan ing Commission. It is reported that th Government will accept this recommenda tion. In his first address to the Centr Parliament, President, Dr. Prasad sai "It is my Government's intention to estab lish a Planning Commission so that th best use can be made of such resources a we possess for the development of th nation." As planning depends on statist cal information, the President said Central Statistical Organization too woul be established.

According to the Congress Workin Committee's suggestions, the propose Planning Commission will have to unde take the following duties:—(1) "to mak an assessment of the resources and re quirements of the nation; (2) "to deter mine priorities to work out a prope allocation and distribution of th resources and their constant adjustment t the changing requirements with a view t obtaining the speediest and maximu realization of the objectives of the pla (3) "to lay down the various stages fo the development of the country's econom and to undertake the necessary prepara tory work in connection with each stag and (4) "to secure full and all-round co ordination in the process of planning an in the execution of the plan."

The above are only the long-term duties of the Commission, while for the time being the Congress Working Committee wants it to reduce the country's dependence on imports to the minimum; to dispense with the imports of luxury goods; to secure capital goods; to produce the maximum possible quantity of food and raw materials within the country; to speed up irrigation and power supply projects. Obviously these precisely are the activities on which the Government too is bestowing attention at the present moment.

From a study of the Congress Working Committee's recommendations it is clear that the proposed Planning Commission is meant to be an advisory body only. While the Commission's function will be to guide and chalk out programmes of development, the actual work will have to be done by the Central and State Governments.

SEWING MACHINE INDUSTRY

The sewing machine industry is comparatively new in this country. At present there are only two factories both located in Calcutta for manufacturing sewing machines. In 1946-47 as many as 6,871 machines were produced. But in 1948-49 production showed a marked increase to 21,740 machines. In 1949-50 it is expected that the indigenous production may run up to 28,000 machines; and in 1950-51, to 31,500 machines. The quality of the indigenous sewing machines is reported to be satisfactory.

So that the production of sewing machines may steadily improve, the Government have agreed, on the recommendation of the Tariff Board, to extend existing protective duties for the industry for 3 years ending March 31, 1953. The Tariff Board has also recommended that a distinction should be made between industrial and domestic machines. Sewing machines with a landed cost of above Rs. 300, inclusive of the cost of cover. will be regarded as industrial machines. Those costing Rs. 300 or below will be regarded as domestic machines. If the landed cost of a machine exceeds Rs. 300 for the mere fact that it is fitted with some special apparatus, it will be treated as a domestic machine.

—MANUFACTURE OF ARTIFICIAL GEM[S]

THE fact that pieces of suitably tinted glass can be made to show a superficial resemblance to precious stones, has led to the manufacture of imitation jewels of all descriptions. The glass employed for the purpose must possess greater hardness and specific gravity than the ordinary product and coloured to stimulate the precious stones. Finally the external shapes of gems are, of course, readily imitated by cutting and grinding the glass.

All the properties mentioned above are imparted to the flux, partly by special treatment, partly by admixtures but principally by the purity of the substances used. Besides the essential components, lead oxide, minium, etc., are added to the fluxes. These impart greater density to the glass, more lustre and density. But too much lead oxide must be avoided, as it disintegrates the surface and spoils the lustre. A great degree of hardness can be obtained by using large proportions of silica, but the flux becomes refractory, to prevent which borax is added.

RAW MATERIALS

The raw materials which are required for mixing a good flux are as follows:—

1. Silica, Pure. It is best to use for finely powdered quartz or rock crystals.
2. Chemically pure potash or sodium carbonate.
3. Borax.
4. Lead oxide, Carbonate or minium.
5. A little potassium nitrate, partly to promote the fusion, but especially to destroy by oxidation any carbonaceous impurities which might injure the colour.
6. A metallic oxide to impart colour to the flux.

FURNACE REQUIRED

In melting a specific composition a[n] ordinary glass-melting furnace can be em[-]ployed. The best type of furnace is fu[r]nished with a gas-conducting pipe fro[m] which four pipes branch off. The upp[er] end of these pipes is bent inward. T[he] gas flame plays under the fire-brick fu[r]nace, the thick walls of which form t[he] hearth. The bottom is provided with a[n] opening through which the gases ent[er] into the crucible placed exactly over it, [so] as to circulate around the alcohol crucib[le] containing the flux, and resting upon [a] support of fireclay and a moveable ro[d]. The gases, after playing around the cr[u]cible pans out through a hole in the cov[er] and then around and down the walls t[o]wards the escape pipe.

TREATMENT OF INGREDIENTS

The ingredients are separately grou[nd] to impalpable powder, sifted through [a] fine sieve and then weighed. These a[re] then intimately mixed in a mortar and p[ut] in a new Hessian crucible and cover[ed] with a clay plate. The crucible is ne[xt] introduced into the furnace and heated [by] gas flame from bottom. When the ma[ss] has been fused the crucible is withdraw[n] from the hearth and the clay plate is r[e]moved to pour out the molten mas[s]. After allowing to cool to normal temper[a]ture the glass is cut into desired sha[pe] and polished.

The following recipes being conside[r]ed have been reproduced from T[he] Chemical Formulary of Mr. H. Bennet[t]

FLUXES

Quartz	20.23	parts.
Sodium carbonate	14.61	„
Calcined borax	10.96	„
Minium	7.20	„
Potassium nitrate	3.65	„

Reduce the ingredients to fine powder separately and mix. Then fuse the mixture in the manner described under general process.

A harder flux is obtained by mixing the substances in the following proportions:—

Rock crystals	43.84	parts.
Sodium carbonate	14.61	„
Calcined borax	10.96	„
Minium	7.20	„
Potassium nitrate	1.21	„

A flux so hard that it will spark when struck with a piece of steel can be prepared from the following ingredients:—

Rock crystals	10.96	parts.
Powdered glass	29.23	„
Minium	10.96	„
Calcined borax	2.20	„
Potassium nitrate	2.43	„
Arsenic	0.60	„

Pure flint finely ground may be used in place of rock crystal, or white-powdered glass, but in the latter case some white arsenic must be added to obtain the frit entirely colourless.

These fluxes furnish the "Strass" which is the basis for manufacture of artificial gems.

RUBY

	I.	II.
Quartz	29.32	2932
Sodium carbonate dry	14.61	14.61
Calcined borax	10.96	4.84
Potassium nitrate	5.47	2.43
Copper oxide	3.65	0.91
Antimony trisulphide	0.50	—
Manganese dioxide	0.50	—
Minium	10.92	—
Sal-ammoniac	—	3.65

SAPPHIRE

	I.	II.
Rock Crystal	43.84	29.23
Sodium carbonate	21.92	14.61
Borax	7.20	10.96
Minium	7.20	5.47
Potassium nitrate	3.65	1.82
Cobalt carbonate	0.06	—
Copper carbonate	—	1.82

EMERALD

Rock crystal	43.84
Sodium carbonate, dry	14.61
Calcined borax	7.20
Minium	7.20
Potassium nitrate	2.43
Cobalt carbonate	0.09
Chrome green	0.30

The above mixture produces a beautiful green coloured emerald.

As a general rule uranic oxide which gives yellow colours shading only slightly into green, furnishes an emerald green when used in the following proportions:—

Rock crystal	36.43
Sodium carbonate	10.96
Minium	7.20
Potassium nitrate	3.65
Uranic oxide	2.43
Green copper carbonate	0.18
Stannic oxide	0.18
Calcined bone	0.18

CHRYSOPRASE

The following mixture is decidedly the best for imitating the transparent, apple-green colour of this stone:—

Rock crystal	43.84
Sodium carbonate	14.61
Calcined borax	10.96
Minium	7.20
Potassium nitrate	1.21
Calcined borax	7.20
Copper carbonate	0.12
Ferric oxide	0.24
Chrome green	0.36

The above mixture produces dark coloured stone.

OPAL

Rock crystal	32.29	parts.
Sodium carbonate	10.96	„
Calcined borax	7.20	„

Minium	5.47	parts.
Potassium nitrate	0.91	,,
Copper oxide	0.06	,,
Calcined bones	0.09	,,
Silver chloride	0.12	,,

GARNET

Rock crystal	32.29	parts.
Sodium carbonate	10.96	,,
Calcined borax	7.93	,,
Minium	5.47	,,
Potassium nitrate	2.43	,,
Manganese dioxide	0.36	,,
Ferric oxide	0.18	,,

If a brighter colour is desired add 0.06 part of copper oxide to the mixture.

AMETHYST

Amethyst may be prepared by using manganese dioxide, but not more than 0.06 part of it must be taken for a *frit* producing about 30 parts of flux. Powdered glass in the proportion of 30 parts, 3.65 parts of potassium nitrate, and some borax and minium give also a good imitation of the amethyst.

LAPIS LAZULI

Rock crystal	21.92	parts.
Sodium carbonate	7.20	,,
Calcined borax	5.47	,,
Minium	3.65	,,
Potassium nitrate	1.00	,,
Calcined bones	3.65	,,
Cobalt oxide	0.12	,,

AGATE

Agate can be imitated by allowing fragments of different fluxes to run together, stirring the mass in the meanwhile.

Several varieties of agate are obtained by mixing about 1.82 parts of ferric oxide with 43.84 parts of flux.

ANOTHER METHOD OF PRODUCING GEMS

The following is another method of producing artificial gems:—

2 parts of pure quartz, 1 part of calcined soda, ¾ part of anhydrous borax, 1/16 part of lead oxide are rubbed together as intimately as possible, and heated in a crucible for one hour without allowing the mass to become liquid. It is then brought into fusion and kept so for one hour, when it is allowed to congeal. It is then moderately heated for 24 hours, and then the remelting flux taken from the crucible, cut and grained.

This forms the base for the flux of the artificial gems.

The following minerals are added as colouring substances:—

Blue	Cobalt oxide
Yellow	Antimony pentoxide.
Green	Cupric oxide.
Red	Purple of cassius.
Violet	Manganese dioxide.

FLUORESCENT GEMS

Artificial gems which fluorescent a bright greenish or yellow colour under ultraviolet light may be cut from ordinary green glass which contains uranium as a pigment.

By adding small amounts of manganese, chromium, or uranium to fused glass and allowing the metal to dissolve in the glass, a highly fluorescent substance is produced. This can be cut into *cabochon* and facet gems suitable for theotricial and advertisning effects.

—TOOTH PASTES & THEIR MANUFACTURI

TOOTH paste is one of the important articles of commerce and is largely used by all classes of people in cleaning their teeth.

A good tooth paste must cleanse the teeth safely and effectively. It should have a stable, uniform consistency that will make it easy to use under all conditions of temperature from 40°F to 110°F. it shall not separate or harden in the tubes while possessing sufficient fluidity to adhere to the bristles of the brush.

RAW MATERIALS

The maker of tooth paste has an extremely wide selection of raw materials from which to draw. Among the most commonly used are the following:—

Precipitated chalk, tri-calcium phosphate, magnesium carbonate, titanium dioxide, kaolin, colloidal clay, powdered orris root, neutral soap powder, potassium chlorate, common salt, sodium bicarbonate, tartaric acid, sodium citrate, glycerin, honey, the mucilages of tragacanth, acacia, and karaya, cane sugar, glucose, saccharin, flavouring materials such as oil of wintergreen, peppermint, eucalyptus, and sassafras, menthol, thymol and a host of other incidental materials.

DIFFERENT FUNCTION OF MATERIALS

The following list will show how the raw materials may be classified; sometimes more than one function is confined in the same material.

Polishing Agents:—These polish the teeth. These are:—Precipitated chalk, tri-calcium phosphate, magnesium carbonate, titanium dioxide, colloidal clay, kaolin, kieselguhr, pulverised orris root, calcium sulphate, etc.

Vehicles:—These form the paste and impart the necessary fluidity. These are: —Alcohol, glycerin, ethyl ether of diethy lene glycol, water, honey, syrup, an mucilage.

Binders:—These prevent separation Starch, glycerite of starch, mucilages o tragacanth, agar and karaya, pulverise neutral soap.

Sweeteners:—Sugar, honey, sacchar in, and glucose. They import a pleasan character to the cream.

Flavours:—Peppermint, mentho wintergreen, anise, eucalyptus, clove thymol, cassia, etc. These will cove earthy taste of the base, and have pdeasant after-sensation in the mouth.

Lubricants:—Mineral oil, sulphonate olive oil, etc. These will cause the crear to extrude easily from the tube and als prevent hardening.

Antiseptics:—Boric acid, benzoic acid sodium benzoate, parahydroxy, carboli acid, salol, thymol, etc.

Active Agents:—Sodium bicarbonate potassium chlorate, tartaric acid, commo salt, borax, sodium citrate.

Colour:—This is optional, phenol phthalein being used in alkaline paste an also in powders to produce a pink shade

Preservative: — Salicylic acid is good preservative 1 in 1000 parts i sufficient.

BUILDING THE RECIPE

With the function of each materia clearly understood, the next step is t evolve formulas with the several func tions properly balanced. Correct balanc is represented by the following approxi mate percentages.

Polishing agents	40	to	45	per cent
Vehicle	40	to	45	„ „
Binder	4	to	8	„ „
Sweetener	½	to	4	„ „

Flavour	½	to	1	per cent.
Antiseptic	1/10	to	2	„ „
Preservative	1/10	to	½	„ „
Active agents	1	to	5	„ „

The purpose of the paste will determine how many of the functional groups need be present, the first five functions of course being necessary to all tooth pastes of whatever kind.

Now let us form some good formulas for various kinds of paste. We wish to emphasize that all formulas should be exhaustively tested before use. Samples should be frozen; others should be kept at 35°F for several weeks; still others should be kept for five weeks in a thermostatically controlled oven at a temperature of 110°F. These tests will tell whether the paste is likely to harden after it has been placed in the market.

GENERAL PROCESS OF MANUFACTURE

This is a little more difficult than the production of tooth powders, and the inside of the machine and blades should be at least tinned, but for preference enamelled. The best type of modern machine is the ointment or roller mills. Dough mixers also make very good pastes, but the movement of the blades should be slow. If rotation is too rapid the paste will contain a lot of air bubbles, which is a decided disadvantage, and will cause trouble while the cream is being filled into tubes.

The excipient is first mixed with the desired quantity of water, and some of it is placed in the machine. The powder bases, which have been previously sifted, are now added gradually, the right balance or consistency being maintained by the frequent addition of further quantities of excipient. The flavouring agents are added during this part of the process, as also the mucilaginous bodies, if contained in the formula. The soap is added last, when the cream will immediately become very soft. Mixation is continued until even distribution of all the constituents has been attained, and the product is then put through a fine sieve to remove any grit or lumps of congealed soap, etc. The cream is allowed to stand a few hours and then filled.

FILLING INTO TUBES

Filling into tubes is an operation which requires much attention on the part of the manufacture, and if the methods are not efficient much money may be lost. There are several machines obtainable, and the usual pattern for small production is worked by hand, and consists of a hopper for the cream, a forcer manipulated with the right hand, and a cut-off operated either by the left hand, or preferably by the foot, when the left hand is free to place the tubes on the ejecter. For large-scale production there are machines which do everything but pack the closed tubes in boxes. Some of these are satisfactory, but they are generally very expensive and require much careful attention.

FLAVOURS

Flavours are generally used to cover the earthy odour of the base and also give a good pleasant sensation in the mouth. A number of flavours specially suited to the manufacture of tooth paste are as follows:—

I

Peppermint oil	2	parts.
Cinnamon oil	2	„
Anise oil	2	„
Clove oil	2	„
Wintergreen oil	3	„

II

Peppermint oil	30	parts.
Anethol	3	„
Cinnamon oil	5	„
Lavender oil	2	„

III

Eucalyptus oil	12	parts.
Menthol	1	part.
Peppermint oil	8	parts.

CHEAP

Precipitated chalk	38	per cent.
Kaolin	3	,, ,,
Tri-calcium phosphate	6	,, ,,
Tragacanth mucilage (5%)	3	,, ,,
Glucose	4	,, ,,
Glycerin	15	,, ,,
Hot water	30½	,, ,,
Flavour	½	,, ,,

Put the hot water, glucose and mucilage into a mixing vessel. Soft the dry materials and slowly add to the liquids while mixing. Mix until smooth paste is obtained, then run through an ointment mill. Add a preservative ½ to 1 per cent.

HIGH GRADE

Precipitated chalk	34	per cent.
Tri-calcium phosphate	12	,, ,,
Gum tragacanth, powdered	1	,, ,,
Soap powdered	4	,, ,,
Glycerin	24	,, ,,
Hot water	18	,, ,,
Saccharin, soluble	0.1	,, ,,
Flavour	0.4	,, ,,
Alcohol	5	,, ,,

Mix the alcohol and the gum, add the hot water, glycerin, soap, saccharin and flavour. Mix for half an hour. Fuse, mix and sieve the dry ingredients and slowly add them to the liquid. Mix until a smooth white paste is obtained, pass through ointment roller mill.

Double precipitated chalk	400	grams.
Magnesium carbonate	100	,,
Calcium phosphate	100	,,
Alum powder (fused)	20	,,
Borax	10	,,
Glycerine, syrup, honey		as requir[ed]
Paraffin oil (for easy flow)	10	gram[s]
Peppermint, thymol, camphor & cinnamon oil	5	,,
Rose scent & oil of geranium	5	,,
Good soap powder	150	,,

Mix the powders and paste them carefully. Bring it to the consistence of [a] standard paste of the market. Finally add the medicaments and the perfumes. Soap may be dissolved in a very little hot glycerine or water. This is a good antiseptic tooth paste.

IV

Precipitated chalk	500	grams
Tricalcium orthophosphate	400	,,
Soluble saccharine	0.5	,,
Castile soap powder	100	,,
Tragacanth	1	gram.
Peppermint oil	5	grams.
Spearmint oil	1	gram
Methyl salicylate	2	grams.
Clarified honey, Glycerine, Water		Sufficient quantity.

Mix the chalk and orthophosphate. To a portion of it incorporate the essential oils. Then triturate the whole mass with tragacanth. Now dissolve saccharine in alcohol and mix glycerine and honey with water. Then mix well together and lastly add soap. The paste will be white.

V

Precipitated chalk	6	oz.
Magnesium carbonate, heavy	1	,,
Orris root, powder	1	,,
Hard soap, powder	1	,,
Oil of eucalyptus	2	mins.
Thymol	10	gr.
Methyl salicylate	20	mins.
Lemon yellow		to tint.

Simple syrup	1 part.	a sufficiency.
Glycerine	1 part.	
Water	1 part.	

As already detailed. This gives a thymol and eucalyptol paste.

ACID REACTING TOOTH PASTE

Titanium dioxide	7	parts.
Talc	35	,,
Glycerine	29	,,
Tartaric acid solution (10 p. c.)	9	,,
Pectin from citrus fruit	¾	part.
Flavour	¾	,,
Sugar	3½	parts.
Sodium benzoate	¼	part.

Dissolve the pectin powder in the acid solution. Heat the glycerine and water; add the sugar. Mix well. Add the preservative and flavour and mix again. Sift in the dry material, mix thoroughly in a paste mill.

ALKALINE TOOTH PASTE

Precipitated chalk	60	oz.
Magnesium carbonate	28	,,
Borax	10	,,
Glycerine	40	,,
Water	56	,,
Powder neutral white soap	4	,,
Saccharin	1/5	,,
Flavour	1	,,

Mix.

MAGNESIA TOOTH PASTE

Milk of magnesia	24	parts.
Magnesium carbonate	10	,,
Precipitated chalk	18	,,
Soap, powdered neutral white	2	parts.
Glycerite of starch	12	,,
Glycerine	12	,,
Water	20	,,
Flavour	½	part.
Mineral oil, heavy	1½	parts.
Saccharin	1/5	part.

To boiling water add glycerine saccharin, milk of magnesia, and the glycerite. Mix for half an hour and then add the dry materials very slowly. Finally add flavours and mineral oil. Mix for another hour and put in a paste mill.

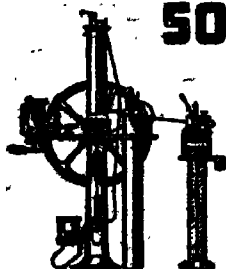
Glycerite of starch as prescribed in the recipe is made as follows:—

Corn starch 40 parts; Water 25 parts; Glycerine 35 parts.

Mix into a smooth paste.

TARTAR REMOVING TOOTH PASTE

Precipitated chalk	35	lbs.
Powdered neutral white soap	2	,,
Magnesium carbonate	8	,,
Bentonite	3½	,,
Sodium bicarbonate	6	,,
Glycerite of starch	28	,,
Liquid paraffin	1	lb.
Irish moss infusion (2 in. 28 parts water)	28	lbs.
Saccharin	2	oz.
Flavour	1	lb.

Mix thoroughly.

—MANUFACTURE OF SEALING WAXES

SEALING waxes are articles that have almost ceased to be in general use, but they are so serviceable in many cases where other adhesives are not suitable, that they will never entirely go out of use. The manufacture of sealing wax in stick form is only in a few hands; but as there are so mysterious difficulties in producing these waxes, instructions given in this article will afford the requisite particulars for the production of this article by any person who so desires.

In composition, sealing-wax is a varnish body, mixed with pigment, but without any thinner. Good qualities consist of shellac and larch turpentine, whilst in poorer qualities the shellac is partly or entirely replaced by colophony, spruce resin, or cumarone resin, and the turpentine by turpentine oil. Good sealing-wax should melt on heating without dropping off the stick, even if set alight. When applied in the molten condition to paper, it should not set before it has spread well. The setting time should be of such duration that an impression can be made with the seal, to which the wax should not adhere. On the other hand, the finished seal should adhere well to the paper, so that it cannot be removed without tearing it, and so that the attempt to remove it may be obvious. Stick sealing-wax adheres to the paper only if it contains shellac. No other material is able to replace shellac in this respect, and the proportion of shellac in a sample of sealing-wax may be determined by comparative tests, in which several seals from the various samples are made on the same paper and the adhesion of the unknown samples is compared with that of known composition. Sealing-waxes, which, apart from the turpentine, contain shellac only, are now no longer sold. In fact, a small proportion of shellac (about one-fifth of the total resins) is sufficient to ensure sufficient adhesion. The turpentine serves to reduce the melting point and the brittleness. Oil of turpentine or even white spirit are added to cheap qualities; these certainly reduce the melting point, but leave a brittle seal which breaks easily. As sealing wax must not soften at high summer temperatures, the softening and melting points must be close together and in the neighbourhood of 100°C. According to German patent 414,258 (MLB), a balsam-like artificial resin can be obtained from colophony and alkylating agents, such as p-toluenesulphonic acid methyl ester, by causing them to interact in presence of basic substances such as caustic soda. It is stated that these products are able to replace Venetian turpentine (genuine larch turpentine). Adulterated turpentines contain rosin oil, which makes the seal sticky and does not impart the required flexibility. Inorganic pigments are most used, but colour lakes have been introduced into these products. It is necessary that the pigment should withstand a temperature of 120 to 130°C., the temperature of the molten wax. True vermilion just withstands such a temperature, and is more suitable for red sealing-wax than any other pigment. As colour bases, magnesia, chalk, and barytes are used; substances which are too absorptive must be avoided, as otherwise the material is too brittle. In the production of sealing-wax, the resins and the turpentine are melted in enamelled pans, without stirring. The pigments are ground with a portion of the turpentine or with a small quantity of turpentine oil, preferably in a roller mill, and are then stirred into the melt. The mass is then boiled for

a very short time, allowed to cool until the mass is homogeneous, and is then poured into polished brass moulds, which have previously been greased or moistened. After cooling the sharp edges must be rounded, which is effected by heating in a flame or for a short period in a muffle on a waxed metal sheet. During this *operation the sticks are also stamped*. whilst their surface is softened; sometimes the stamp impression is already produced in the mould, in which case it is merely necessary to round the edges. Four qualities of stick sealing-wax are recognized: Bank, letter, packet and bottle sealing-waxes. The first two qualities usually contain shellac. A good bank or letter sealing-wax is produced as follows:

Venetian turpentine	6	parts.
Colophony	12	,,
Bleached shellac	20	,,
Vermilion	8	,,
Barytes	10	,,
Turpentine oil	4	,,
Gypsum	6	,,
Turpentine oil	4	,,

Melt the first three ingredients and then the ground mixture of the remaining ingredients are stirred in. Next pour in suitable moulds. When cold take it out and polish.

A somewhat cheaper quality may be as follows:—

Venetian turpentine	6	parts.
Resin	35	,,
Bleached shellac	12	,,
Barytes	40	,,
Pigment lake red	1	part.
Hansa yellow	0.1	,,
Turpentine oil	2	parts.

Ultramarine is used as a blue pigment, chrome green as a green, and chrome yellow.

Packet sealing-wax is used for sealing packages. The requirements are not so high as for the better qualities, and therefore contains no shellac. contains:—

Colophony	40	parts.
Turpentine oil	10	,,
Cumarone resin	15	,,
Lithopone	8	,,
Barytes	60	,,
Hansa red	1	part.

Bottle wax is used for sealing bottl by immersing the head of the bottle in th molten sealing wax. The same mixtu may be used as for packet wax, but wax are often added. Such a bottle wax ma contain:—

Colophony	40	parts.
Carnauba wax	2	,,
Hard paraffin	2	,,
Barytes	40	,,
Lithopone	1	part.
Fast fat yellow	0.4	,,
Turpentine oil	2	parts.

As the seals on letters and package are easily broken, attempts have bee made to produce elastic seals, whic would retain their elasticity at lea during the period of transport, withou either breaking or sacrificing the oth qualities of a good seal. An elasti varnish of the required character obtained by adding 5 to 6 per cent. o Palatinol C to the melt, immediatel before pouring into the moulds. It i however, necessary to employ mixture containing much shellac, as those contain ing resin adhere to the seal if Palatin has been added. This is also true of othe softening agents, such as triphenyl phos phate and tricresyl phosphate. The stick of sealing-wax are wrapped in tin-foil i order to prevent evaporation of th Palatinol.

According to German patent 435,68 a sealing-wax is obtained, which is pres sure-resistant and less easily broken, b melting asbestos fibres into the mass.

Endeavours have been made to avoid the inconvenient heating or lighting of the sealing-wax by attaching a wick to the outer surface of the stick (German patent 422,672). The heat from the burning wick is, however, insufficient to melt the wax rapidly. An essentially new idea was contained in German patent 428,721. according to which a stick of metaldehyde is enclosed in a stick of sealing-wax. This variety of sealing candle works very well and offers the further advantage that the impression is not contaminated by soot, as is always the case when ordinary sealing-wax is alight. Sealing-waxes are used which melt more easily, so that the disadvantage of discoloration is avoided; moreover, it is not necessary to set the wax alight, which frequently results in the burning of the object to be sealed. Self-burning wafers in the form of a seal may also be produced by coating them with a solution of metal-dehyde and colophony in alcohol.

The most practical form of sealing-wax is, however, one for which no heating is necessary. Liquid, or cold, sealing-waxes have been proposed for this purpose. In German patent 385,495 a mass is described which consists of drying oils (varnish oil) "light oils" (naphtha, petroleum spirit, alcohol) and glue, which is ground with a pigment. According to a patent application of the author, Zapon varnish or Zapon varnish substitute is ground with pigments to form a thick paste. Softening agents may also be added to this sealing-wax. The wax is excellently adapted for mixing with metallic bronze powders, by which means much more beautiful bronze seals are obtained than from stick sealing-wax. The cold sealing-waxes are supplied ready for use in tubes, from which the required amount is expelled and then impressed by the seal. According to the proportion of admixed pigment the hardening period is either about equal to that of ordinary sealing-wax or slightly longer.

In the production of sealing-waxes of all kinds, pigment dyestuffs and fat-soluble are used, in addition to inorganic pigments.

The following dyestuffs are recommended by the I. G. Farbenindustrie:—

YELLOW AND ORANGE

Auramine Base, Hansa Yellow G, Fast Fat Yellow O, Hansa Orange R, Fast Yellow AT, Pigment Orange R, Fast Orange RRP.

BLUE

Blue 2T, Base, Victoria Blue B,

BLACK

Spirit Black N.

RED

Fat Red R, Pigment Lake Red LC, Hansa Red B, Pigment Purple, Rhodamine B.

VIOLET

Methyl Violet 2B, Base.

GREEN

Malachite Green, Colour Base.

With Chrome Yellows, more beautiful yellow sealing-waxes are obtained than with organic pigments. Ultramarine decomposes slightly on melting. The temperature of molten sealing-wax is about 120 to 140°C. At 150°C. shellac shows a tendency to form gum.

—MANUFACTURE OF SPIRIT VARNISHES

THE manufacture of spirit varnishes is an industry which at the present time has assumed very great importance.

Spirit varnishes are made by dissolving resins in oil of turpentine, alcohol, acetone, and other volatile solvents without the addition of any drying oils. These varnishes dry up very quickly, with a high lustre, and hence are largely used as protective coatings for indoor work where quick results are required.

GENERAL PRINCIPLE

The manufacture of spirit varnishes is an extremely simple operation, and is carried out usually by dissolving the resins in the cold in the various selected solvents in the following manner:—

The broken-up resin is emptied into a large barrel, which is fixed on to supports on which it can revolve. The required amount of solvents is added, the covered screwed on, and the contents churned for a few hours till solution has taken place.

In the case of the higher boiling paint solvents it is usual to meet up the resins in a steam heating pan or by direct heat over a fire, and then to stir in the solvent; or, alternately, to warm up the solvent and stir in the finely powdered resins.

By this means the process of dissolving the resins is very considerably accelerated. The varnishes may be filter pressed to remove any suspended matter.

ALCOHOLIC SPIRIT VARNISHES

The most important of the alcoholic spirit varnishes, and the one in most general use, is shellac varnish, which is sold under the name of French Polish.

French Polish is made by dissolving shellac in methylated spirit in the cold in the following manner:—

Orange shellac	60	lbs.
Venice turpentine	5	„
Methylated spirit	40	gallons

The first two ingredients are churned for 6 hours with the methylated spirit. The resulting varnish has an orange brown turbid appearance, and dries in about 10 minutes, with a hard lustrous coat. The venice turpentine helps to toughen the film and so increase its durability.

For white varnishes bleached shellac may be used; for dark varnishes ruby or garnet shellac.

Knotting varnishes which are so largely used by painters as a first coat on printing on wood, are also prepared by dissolving shellac in methylated spirit.

WHITE HARD SPIRIT VARNISHES

These varnishes are made by dissolving spirit soluble Manila Gums in alcohol or methylated spirit, usually about 3 lbs of Manila Gum to 1 gallon of alcohol being the proportion adopted.

BROWN HARD SPIRIT VARNISHES

The varnish is made in a similar manner to white hard spirit varnish, but a small percentage of Bismark brown is added to give the requisite colour.

RESIN ALCOHOLIC SPIRIT VARNISHES

These are made by dissolving pale rosin in alcohol, about 4 lbs. of rosin to 1 gallon of alcohol. They are rather brittle, hence are only used for common work.

In addition to the resins already mentioned, many others can also be used in alcoholic solution for the preparation of quick drying lustrous varnishes, among which may be mentioned gum mastic, sandarac, elemi, etc.

Various softening agents may be used in small proportions in conjunction with the above-mentioned resins in order to toughen their films and prevent them from taking off. The usual ones employed are castor oil, venice turpentine, gumthus, copaiba balsam, and Burgundy pitch.

The following recipes collected from Livache, Hurst, Bottler, and others will give a general indication of the various proportions which are commonly employed in the preparation of alcoholic spirit varnishes, and the purposes for which they are used:—

DARK BROWN POLISH

Garnet shellac	4	lbs.
Methylated spirit	2½	gallons.

SHELLAC SPIRIT VARNISH

Orange shellac	10	lbs.
Venice turpentine	3	,,
Methylated spirit	36	gallons.

PAPER VARNISH

I

Sandarac	5	lbs.
Thick turpentine	3	,,
Alcohol	15	,,

II

Manila copal	16	parts.
Varnish turpentine	5	,,
Alcohol, 95 per cent.	30	,,

WHITE POLISH

Bleached shellac	4	lbs.
Methylated spirit	27	,,

BOOKBINDERS' VARNISH

Shellac	82½	lbs.
Spirit turpentine	3	gallons.
Methylated spirit	80	,,

BOOKBINDERS' WHITE VARNISH

Gum sandarac	2	parts.
Gum mastic	1	part.
Gum Elemi	1	,,
Alcohol	50	parts.

ROSIN VARNISH

Pale rosin	23	lbs.
Venice turpentine	4	,,
Alcohol	16	,,

NEGATIVE VARNISH FOR PHOTOGRAPHERS

Gum sandarac	5	oz.
Gum benzoin	2	,,
Methylated spirit	½	gallon.

COLOURED LACQUERS

Coloured lacquers are made in large quantities for colouring metals, wood leather goods, etc. They are applied to metals in two ways known as "Cold Lacquering" and "Hot Lacquering".

The colouring of the lacquers or spirit varnishes is usually effected by adding to them concentrated alcoholic solutions of aniline dyestuffs. The following recipes for the preparation of various coloured lacquers will give a general idea as to their composition:—

DEEP GOLD LACQUER

Bleached shellac	3	lbs.
Methylated spirit	2	gallons.
Fuchsine concentrated solution	¼	pint

PALE GOLD LACQUER

Bleached shellac	10	oz.
Methylated spirit	1	gallon.
Aniline yellow concentrated solution	¼	pint.

BLUE LACQUER

Shellac	5	oz.
Sandarac	5	,,
Elemi	2	,,
Alkali blue concentrated solution	½	pint.
Methylated spirit	1	gallon.

VIOLET LACQUER

Shellac	2	oz.
Sandarac	8	,,
Elemi	3	,,
Methylated spirit	1	gallon.
Methyl violet concentrated alcoholic solution	¼	pint.

TURPENTINE SPIRIT VARNISHES

These spirit varnishes may be made by dissolving the resins in the turpentine or turpentine substitutes or benzol in the cold in precisely the way as described under the alcoholic spirit varnishes.

In general however it is customary to melt up the resins and stir in the volatile solutions, as by this means much quicker solutions are obtained. Turpentine varnishes dry more slowly than alcohol varnishes, hence are more easy to apply.

DAMMAR VARNISH

Dammar varnish is largely used as a paper varnish under the name of crystal paper varnish. It is prepared by melting pale dammar gum and thinning down to the right consistency with turpentine or white spirit. The following proportions may be used:—

Dammar	10	oz.
Sandarac	5	,,
Mastic	1	,,
Turpentine	20	,,

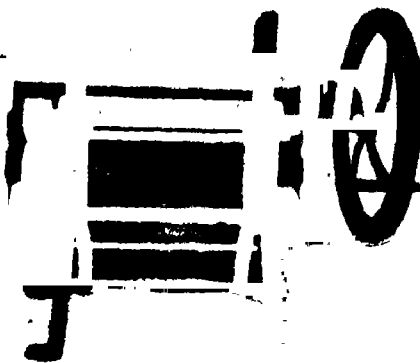
The mastic and sandarac gums are added to give toughness and elasticity to the varnish.

ROSIN, TURPENTINE SPIRIT VARNISHES

These varnishes may be prepared by churning rosin or hardened rosin with turpentine till solution is effected, or the rosin may be melted and the turpentine stirred in till the required consistency is obtained.

White spirit and naphtha are often used in place of turpentine to reduce the cost of production.

Rosin spirit varnishes are largely used as furniture varnishes and cheap oak varnishes for inside work. They dry with brilliant glossy surfaces, but are too brittle to be very serviceable, and are liable to powder off on rubbing.

They are also used in the manufacture of common quick-drying varnish paints with the addition of pigments such as red oxide, lithopone, carbon black, and so on.

—MANUFACTURE OF VERMILION

THE mineral cinnabar or vermilion has been used as a pigment from the earliest days, and mention of it has been found as early as 600 B.C. It was used by the ancient Hebrews for painting the walls of their temples. In India vermilion not only employed as pigment but also a toiletery adjunct for Hindu women.

Pliny's cinnabar was true vermilion, though it has often been confused with red lead. It is a compound of mercury and sulphur and occurs naturally as the mineral cinnabar.

The native cinnabar was converted into a pigment by carefully grinding selected pieces and sieving.

Although ancients used the naturally occurring product, this has now been replaced by the manufactured article.

The Chinese have been renowned as makers of vermilion for many hundreds of years, and even at the present time the variety produced in that country is the most highly esteemed. The process of manufacture used by the Chinese has always been very jealously guarded, and kept in certain families, where it has been handed down from father to son.

Native cinnabar cannot be used as vermilion because of impurities which affect the colour. The methods used in manufacture of vermilion may be divided into two classes, viz:—

1. The Dry Method, in which the raw materials, mercury and sulphur, are combined in the dry state.
2. The Wet Method, in which the reaction is carried on in solution.

Let us now deal with both the processes one after another.

DRY METHOD

These all depend on the preparation of the black sulphide, usually the combination of mercury and sulphur, and its subsequent conversion into the red variety by a process of sublimation. The following method known as the Dutch process is briefly stated thus:—

1080 lbs. of mercury and 150 lbs. of powdered sifted sulphur are moderately heated in an iron pan with constant stirring, and the black "ethiops" or black sulphide of mercury obtained is cooled and powdered. This is introduced in charges about 25 lbs. four times an hour into long subliming pots of refractory clay, each holding about 410 lbs., heated from below to about two-thirds of their height. As each charge is added it ignites, and a long flame escapes from the pot; when this has subsided, the pot is covered with an iron plate. The operation occupies about 36 hours. The pots are cooled and broken, and the vermilion, which is principally in the upper portions, is ground with water between stones, sifted, elutriated, and dried.

It is said that if 1 part of antimonious sulphide is added to the mixture of sulphur and mercury before sublimation, and the vermilion is digested with potassium sulphide, an improved pigment is obtained which contains no antimony.

CHINESE METHOD

The Chinese vermilion is celebrated for its fine colour, which inclines to carmine. It is said to be prepared as follows:—

In the process about 19 lbs. of mercury and 17½ lbs. of sulphide are mixed in an iron pan, about 25 inches wide and 7 or 8 inches deep, and heated by charcoal. When melted, it is stirred with an iron spatula, and further 19 lbs. of mercury is gradually added. When the metal has disappeared the mass is remov-

ed from the fire, cooled by the addition of a little water, rapidly stirred, and coarsely powdered. The reddish or blackish semi-crystalline powder, which contains some free mercury and sulphur, is placed in a fixed iron pan, and covered with porcelain tiles arranged in the shape of a dome. The whole is covered by a pan 4 inches less in diameter than the fixed one, to which it is luted by clay, having 4 holes in the luting for the escape of gases. The charcoal fire is then lighted and kept fire-clay burning for 18 hours; blue flame are then burning round the holes, showing loss of mercury and sulphur. The fires are then allowed to die out and the pans to cool. Most of the vermilion is found adherent to the porcelain, and is removed. That attached to the iron is inferior, and is made with the other waste into cakes with alum and glue water, dried resublimed. The sulphide on the porcelain is blood-red and crystalline. It is powdered and ground with water in a handmill between stones, and washed into a vessel. At the close of a day's work a solution of alum and glue (1 oz. of each to 1 gallon of solution) is well stirred with the powder, and the whole is allowed to stand until morning. The glue tends to lengthen the period of deposition, and to render the stratification into the various qualities more perfect. The alum is said to improve the colour. The liquid is decanted and the upper portions of the deposit are set aside. The lower parts are reground and treated as before, the grinding being sometimes repeated several times. The fine vermilion is stirred in water and settled, and the water is decanted. The residue is dried in the open air, powdered, sifted through muslin, and packed in papers.

WET METHOD

This process is the one that has been adopted by the English and German manufacturers of vermilion. It depends on the action of alkaline sulphides on the amorphous mercury sulphide. The tem perature adopted largely influences th colour.

In order to prepare the alkaline su phide free from hyposulphite, potassiu sulphate is converted into sulphide by ign tion with carbon. The mass is extracte with water, and boiled with sulphur out (contact with air.

Of this strong solution 2½ Kilo digested and agitated with 1 Kilo. sulph and 5 Kilos. mercury at a gentle hea The mixture gradually becomes heate and in about 2 hours acquires a greenis brown colour. After a further period (2 hours it becomes of a rich brown, and allowed to cool to 50°C, and is maintaine at that temperature for 3 or 4 days wi frequent agitation. A fine-coloured ve milion gradually settles down; it is washe with potash, then with dilute nitric aci and finally with water. This process give an excellent yield, and the vermilion pro duced by it is equal in brilliancy to that (the vermilion obtained by the dry metho Moreover, it is very economical, as th mother liquor of potassium tetrasulphic only requires to be digested with flowe of sulphur to be reconverted into potassiu pentasulphide, which may then be use again.

A mixture of 100 parts of mercury wit 38 parts of sulphur (flowers) is triturate for some hours, mixed with a solution c 25 parts potash in 150 parts water, an digested at a temperature below 45°C keeping the liquid at constant volume b adding water.

After 2 or 3 hours it becomes brownis and then gradually brightens. The tem perature must be carefully regulated an the volume kept constant, or the precip tate loses its pulverulent character an becomes inferior in colour. At the prope point, usually after about 8 hours, the heat ing is stopped and the contents are washe as quickly as possible, as the furthe

action of the potash would produce a brown colour. It is lixiviated to separate any black sulphide, and dried.

The chief difficulty in all these methods is to free the vermilion from alkaline sulphides and sulphur, the presence of which is detrimental to the colour of the product.

ADULTERATION

Vermilion is adulterated with red lead, red ochre, chrome red, red oxide of iron and frequently with gypsum. Dragon's blood is sometimes mixed with the vermilion. Chinese Vermilion usually contains a little glue which is not, however, an adulteration.

PROPERTIES AND USES

Vermilion is a bluish-scarlet red powder, and comes on to the market as pale vermilion or deep vermilion. The pale vermilion is obtained from the more crystalline deep vermilion by repeatedly grinding it till the required shade is produced. It has very good body and covering power, and on this account of its brilliant red colour is largely used ground in oil and varnish by artists. It is also used for colouring shellac and also in printing inks.

VERMILION SUBSTITUTES

These are made by precipitating alizarine, iosine, para red, etc. on to barytes, or a mixture of barytes and orange lead.

—PACKING THAT DEFIES INSECTS

PEOPLE in most countries are to-day so accustomed to making use of goods brought from overseas—perhaps from the other side of the globe—that scarcely a thought is spared for the means by which this ceaseless inter-change is brought about. In fact, however, the problem of carrying goods so that they reach their destination in good condition involves not merely transport but also a constant battle against a formidable array of destructive forces.

This battle is particularly fierce in the case of food-stuffs. During their long journeys they must be protected against such enemies as damp, heat, pressure, microbes, moulds, tainting by other merchandise, rodents, and many other agencies.

In Britain the Pest Infestation Laboratory has undertaken research—now successfully concluded—to produce insect-proof wrapping. The results are of the widest importance, for the problem is one common to all countries. Many kinds of insect, akin to furniture beetles, whose tunelling can quickly reduce the finest woodwork to powdery dust, are able to bore through almost any of the conventional packing materials. Paper, cardboard and wood are quickly penetrated and the insects are then free to spoil the foodstuffs or other goods enclosed within the packing.

SERIES OF TRIALS

The story is an interesting one in which a succession of moves was made before the boring insects were finally outwitted. The first task was to identify the insects which were the main cause of the trouble and eventually nearly a dozen of the most destructive ones were selected for experiments. Some were relatively slow borers and did serious damage only when free to carry out their activities for a long time. Others, such as the padelle insect which attacks cereals, appear to bore holes for the fun of it, and consequently do a great deal of damage in a short time.

Experiments were made by placing a package, made with a variety of trial wrappings, in a container swarming with the insects. After an interval it was removed and unwrapped and a count was made of the numbers of each kind of insect which had penetrated to the interior. The route by which they had made their journey was also examined.

The first method tested was the use of a wrapping which included a layer of ordinary sandpaper. The expectation was that the insects would find the hard, gritty layer difficult to penetrate. They soon found cracks where the sandpaper was folded and resumed their destructive march.

USE OF INSECTICIDE

The next attempt was made with wrapping paper impregnated with D.D.T., but it was found that the insects bored straight through it. It is true that in doing so they usually picked up sufficient quantities of D.D.T., to kill them, but the holes they left gave safe entry to the multitudes which came after them.

Then corrugated cardboard impregnated with D.D.T. was tried in the expectation that the insects would crawl along the tunnels in the cardboard and thus acquire lethal doses of the insecticide. Unfortunately, this proved true only of insects of a certain size. The smaller insects dropped immediately to the bottoms of the tunnels and started boring again; the larger ones could not get

through the tunnels and, therefore, ignored them and carried straight on.

Although this last method was unsuccessful, it gave a clue to the method which eventually proved completely successful. The objection to corrugated cardboard was that it contained spaces of only one size and, therefore, caught only one size of insect. What was needed was a material impregnated with D.D.T. and containing pores of all shapes and sizes so that every sort of insect would pick up enough D.D.T. to kill itself.

DEADLY BARRIER

Just the material needed was found in soft cellulose wadding which is commonly used for wrapping radio valves and other delicate objects. When several layers of this, impregnated with D.D.T., are used as wrapping, boring insects enter the deadly labyrinth in which they wander about until the insecticide kills them. In laboratory tests not one insect ever got through this barrier.

An advantage of this wadding is that it need not be sealed. If enough of overlapping is left the insect dies before it gets through, even if it goes straight between the folds.

The wrapping itself is rather bulky—not very suitable for small articles—but it will have a very wide application whenever large packets, such as large cartons of prepared cereals, are being handled. When food is being wrapped, the wadding is enclosed between sheets of paper to prevent the D.D.T. causing contamination. Full-scale commercial trials are just beginning.

—DR. TREVOR I. WILLIAMS.

—PHARMACEUTICAL RECIPES

LIVER OILS

In the extraction of oils from fish livers r other marine animal tissue by breaking own the tissue by dilute alkali, separating the ·ums containing the oil, and breaking this mulsion, there is used to break the emulsion liquid—e.g., ethyl alcohol which is miscible ·ith water but not with the oil. For example, cwt. of halibut livers is pulped by live steam, he volume made up to 135 gal. with water, bout 5 per cent. relative to livers of scale austic potash added, and the mixture brought o boiling by steam and allowed to stand for 1 hours; the lower aqueous layer is run off, nd the emulsion remaining is warmed by team and broken by stirring in 5 gal. of in- ustrial alcohol; 5 gal. of water is added to ring the oil to the surface, the aqueous layer un off, an equal volume of saturated brine dded to the oil, and the whole boiled, settled, nd passed through an oil separator.

BISMUTHATED MAGNESIA

Bismuth carbonate	1 oz.
Sodium bicarbonate	6 „
Magnesium carbonate heavy	6 „
Simple syrup	a sufficiency.

Mix to a slightly damp powder, pass hrough a 20 hole sieve, dry, and compress into 5 grains tablets.

CHAULMUGRA OINTMENT

Chaulmugra oil	10 parts.
Hard paraffin	40 „
Soft white paraffin	50 „

Melt the hard paraffin over a slow fire and ncorporate the other two ingredients. This ointment is very efficacious in Leprosy, Lupus, Eczema, etc.

PIMPLE CREAM

Lactic acid	3 parts.
Citric acid	7 „
Water	40 „
Lanolin	40 „
Cetyl alcohol	100 „
Soft paraffin	800 „
Rhodinol	10 „

Dissolve the acids in the water and beat into the melted mass of lanolin and soft paraffin. Then add the rest of the ingredients and emulsify for a few minutes.

PTYCHO-SODA TABLET

Sodium bicarbonate	5 lbs.
Oil of thymol	½ oz.

Thoroughly well granulate the soda and in- corporate with thymol. The die for the tablet is 5/16th inch and each tablet weighs 5 grains.

SYRUP OF ROSE

Rose petals (Dried)	7 oz.
Water distilled	2 quarts.
Sugar refined	6 lbs.

Take the ingredients in the proportions stated above or in multiples thereof. To prepare the syrup, first of all, the petals of rose are macerated in the water for 12 hours, which will thus produce an extract of rose. Now strain through a piece of cloth to remove the now useless petals of roses. The clear extract is then made to evaporate slowly to two pints and a half. Then add the sugar to it to give it a syrup taste and feeling.

EASTON'S SYRUP

Iron, in form of wire	8.60	grams.
Phosphoric acid concentrated	62.50	millis.
Strychnine, in powder	0.57	grams.
Quinine sulphate	14.80	„
Simple syrup	700.00	millis.
Distilled water, sufficient to produce	1000.00	„

Dilute the concentrated phosphoric acid with an equal volume of distilled water in a small flask ; add the iron and heat very gently until dissolved ; add the solution to the strychnine and quinine sulphate previously triturated with 30 millilitres of the distilled water ; when solution is complete filter the syrup, and pass sufficient distilled water through the filter to produce the required volume.

Dose, one to two fluid drachms.

—Recipes for Small Manufacturers

STAMPING POWDER FOR EMBROIDERY

"Stamping powders" used for outlining embroidery patterns are made by mixing a little finely powdered rosin with a suitable pigment. After dusting the powder through the perforated pattern it is fixed on the fabric by laying over it a piece of paper and then passing a hot iron carefully over the paper. By this means the rosin is melted and the mixture adheres. When white goods are to be "stamped," ultramarine is commonly used as the pigment; for dark goods, zinc white may be substituted. Special care should be taken to avoid lead compounds and other poisonous pigments as they may do mischief by dusting off. On velvets or other materials likely to be injured by heat, stamping is said to be done by moistening a suitable powder with alcohol and using it as stencil paint. A small addition of resinous matter would seem required here also.

INK FOR WRITING ON GLASS

Shellac	20	parts.
Alcohol	150	"
Borax	35	"
Water	250	"

Water-soluble dye sufficient to colour.

Dissolve the shellac in the alcohol, the borax in the water, and pour the shellac solution slowly into that of the borax. Then add the colouring matter previously dissolved in a little water.

BLACK BOOT POLISH

Carnauba wax	6	pounds.
Montan wax	4	"
Ceresine	7	"
Paraffin wax	4	"
Nigrosine	3	"
Turpentine	10	gallons.

Melt the waxes together and then add to them slowly the turpentine in which has been dissolved the nigrosine. Stir till uniform.

AUTOMOBILE POLISH AND CLEANER

A	Water	5	gallons.
	Triethanolamine	8	fluid ounces.
B	Mineral oil	12	pints.
	Oleic acid	20	fluid ounces.
	Abrasive—celite or tripoli	1	pound.

Dissolve the triethanolamine in water. In another container mix the oil and acid and stir well. Add "B" to "A" slowly with constant stirring. Then mix in the abrasive.

The above polish and cleanser is applied with a piece of clean cheese cloth, allowed to dry and then rubbed to a bright surface.

BRILLIANTINE POMADE

Soft paraffin	940	parts.
Beeswax	60	"
Patchouli oil	1	part.
Vetivert oil	1	"
Ethyl cinnamate	1	"
Benzyl cinnamate	1	"
Bergamot oil	5	parts.
Rose oil	3	"
Balsam of Peru	4	"
Musk Ketone	4	"

Melt the paraffin and beeswax over water bath and add the other ingredients. Then put in wide-mouthed bottles.

MUKH BILAS

Cardamom	100	parts.
Cloves	100	"
Cinnamon	100	"
Nutmeg	100	"
Mace	100	"
Cubeb	100	"
Catechu	100	"
Camphor	10	"
Musk	1	"

Reduce the ingredients separately into fine powder and mix thoroughly. Put all the substances together in a mortar and make it a stiff paste with rose water. Bray well for some time. Take this and make it into small pills of 2 to 3 grains each and allow to dry in shade.

JELLIES—WITHOUT FRUIT

Take water 1 pint, and add to it pulverized alum ¼ oz., and boil a minute or two; then add 4 lbs. of white crushed sugar, continue the boiling a little, strain while hot; and when cold put in ½ oz. of extract of vanilla, strawberry, or lemon, or any other flavour you wish for jelly.

This will make a jelly so much resembling that made from the fruit juice that any one will be astonished; and when fruit cannot be got, it will take its place admirably.

—IN THE FIELD OF INVENTION

WATTLE TANNINS

A method effecting almost complete separation of wattle extract into tans and non-tans has been developed at the Leather Industries Research Institute, Grahamstown, S. Africa (Ind. Chemist, 1949, 25, 285). A yield of nearly 100 p.c. of bulk quantities of wattle tannin containing less than 2.8 per cent impurities has been obtained. Work is also on hand to fractionate this purified wattle tannin into fractions of different molecular weights. Further researches in this field are connected with the difference between green and black wattle tannin. Analysis of the two types has shown that green wattle tannin averages 10 per cent greater in molecular weight than black wattle tannin. Previous work at the Institute confirms that limited use of bisulphite liquors removes the colour differences and enables the use of green wattle for making satisfactory leather.

—JOURNAL OF SCIENTIFIC AND INDUSTRIAL RESEARCH.

ANTI-BIOTIC FROM BANANA & SWEET POTATO

Two anti-biotics have been isolated from the pulp and skin of green and ripe bananas. One is active against fungi, specifically the fungus causing wilt disease of tomato plants. The other, apparently formed during the ripening process, is active against bacteria, and is found in the pulp and skin of ripe bananas only.

The sweet potato plant also produces two antibiotics, one of which has activity against fungi. It not only stops the growth of Mycobacterium phei, a non-pathogenic relative of the tuberculosis germ, but kills it (Science Newsletter).

PEST REPELLANT

New chemical treatment, employing pyrethrins or a mixture of pyrethrins and piperonyl butoxide, designed to prevent insects from penetrating cotton bags containing stored flour, has been discovered by two U. S. Government scientists, Dr. Richard T. Cotton, of the Bureau of Entomology and Plant Quarantine, Manhattan. Kansas, and Dr. Winston B. Strickland, of the Southern Regional Research Laboratory in New Oreleans, Louisians.

Laboratory tests are reported to have shown that the common flour insects, in seven months, penetrated none of the treated bags, while one untreated bag admitted 563 of the insects.

Baking tests give evidence that the quality of flour stored in

Experiments were carried out to determine the effectiveness of the chemicals in different concentrations, and it was found that 10 mg of pyrethrins, alone or mixed with 100 mg. of piperonyl butoxide, per sq. ft. of cloth gave protection from such insects as flour beetles, the cadelle, Mediterranean flour moth, lesser grain borer, and others which are able to penetrate or to deposit their eggs through the fabrics of untreated bags.

Protection was also obtained when bags were made of cloth woven from treated warp yarns and untreated filling yarns.

—CHEMICAL PRODUCTS.

SEPARATION OF FATTY ACIDS.

A new fractional distillation plant for the separation of fatty acids has been recently erected in a Lancashire factory. The technique is very similar to that of petroleum fractionation and takes place in fractionating towers constructed of stainless steel which give off 4 fractions containing an overhead fraction including odour and unsaponifiable matter, acids of medium boiling point, acids of high boiling point and a residue. The plant is heated by Dowtherm and is controlled by an elaborate system of instrumentation. High vacuum and close control of the heating ensure high temperatures involved.

The process will produce fatty acids ranging from C-8 to C-22 of up to 90 per cent purity. The unsaturated products will, in some cases, be mixed, since the process does not separate acids of the same carbon chain length.

—CHEMICAL AGE.

NEW VITAMIN FACTOR

A new vitamin factor, biocytin, has been isolated from yeast. Biocytin occurs in nature only in infinitesimal amounts. Yeast extract has one part of biocytin per million of dry matter. More than 8 tons of the extract processed yielded less than 1/30th oz. of the pure material (Sci. Newsletter, 1949,56,137).

—FORMULAS, PROCESSES & ANSWERS

REFINING COTTONSEED OIL

1077 R. A., Montgomery—Wishes to know a process of refining cottonseed oil and colouring mother of pearl buttons.

The principle underlying in the refining of cottonseed oil is that the oil is first passed through a filter press to remove mucilage, etc., and then it is allowed to run into a storage tank. From this it is passed by gravity into the refining tank, where it is heated by steam until it reaches a temperature of about 140°F. Thereafter the oil is violently agitated by means of compressed air, the temperature meanwhile, being kept as near 140°F as possible. During the agitation caustic soda solution is run into the tank. As the solution is heavier than oil it tends to sink to the bottom, so care should be taken if intimate contact with the oil is desired. This can be done successfully by distributing the solution evenly over the surface of the oil and by vigorous agitation. When it has been ascertained by testing that sufficient caustic soda has been added to neutralise the free fatty acid, the charge is allowed to stand and settle.

After settling, which usually takes about 12 hours for complete sedimentation, the mucilage and other residue are drawn off into a pitch-lined tank and the clear oil is passed into washing tank where it is treated with hot water so as to remove all traces of caustic soda. The process may be repeated, if necessary. After this the last traces of moisture may be removed by boiling the oil in vacuum pans.

COLOURING MOTHER OF PEARL BUTTONS

Buttons or other items made of mother of pearl are prepared for dyeing by first cleansing of grease and other repellent substances. This is best effected by immersing the material in a 10% solution of potassium hydroxide for 10 minutes at 620°F and followed by a thorough hot rinsing. Thereafter dyeing is carried out by boiling mildly for 1 to 2 hours in water solution of the selected dyestuffs.

Out of hundreds checked, the following colours give shades of good depth and satisfactory brightness.

Acid Colours: Amacid yellow M conc; Naphthol yellow S; Orange R.O.; Brilliant crocein 3 BA conc; Fast red A Conc; Acid Rhodamine B; Amacid Blue A; Amacid Fast Green BBF; Amacid Black 10 BR; Eosine Y, Formyl Violet 8 B Ex. conc.

The following colours of the Basic class give excellent results as to depth of shade and brightness; Auromine O; Phosphine 2 G; Saframine 6 B; Methyl Violets; Methylene Blue ZF; Rhoduline Blue 6 G.

Basic colours are best applied at 160°F and never in conjunction with acid colours.

PRESERVATIVE FOR FEATHERS

Salicylic acid	10	parts.
Sodium chloride	40	,,
Boric acid	45	,,
Potassium nitrate	65	,,

Grind into fine powder and mix.

RECOVERING SILVER FROM PHOTOGRAPHIC FILM

Place the cut film in a washing machine the regular laundry type will do, and add sufficient solution containing ½ lb. pepsin to 250 gallons of 21/N hydrochloric acid. The solution should be heated to 110°F and the wash wheel containing 200 lbs. of the film should be rotated for 20 minutes. The oil of the solution should be maintained at 2.0 to 2.5.

After the silver and the emulsion have been removed, the precipitated silver is allowed to settle. The liquid is decanted after the pepsin has been exhausted. The black sludge is dried, and then heated to eliminate the organic matter.

To this residue is added 2 parts of soda ash to 1 part of silver and the whole mass is placed in a crucible and melted. After completing the melt, the charge is poured. The pure silver button is separated from the slag by hammering to remove the last traces of slag

D. D. T. POWDER

D. D. T.	10	parts.
Pyrophyllite	90	,,

It is reported that milling the D. D. T. with diluents prevents some difficulties. In addition to the above base, a variety of talcs, clays, and soapstone have been used.

SOFTENING RUBBER ARTICLES

Practically all rubber articles which have grown hard and lost their elasticity may be softened by using glycerin.

First cleanse the article by scrubbing thoroughly with a brush dipped in warm water and place in a solution of 1 part of ammonia to 2 parts of water, allowing it to remain 1 hour or so, until ammonia has evaporated. Then rinse with a diluted solution of glycerin and water. Wipe off and allow to dry.

DECREASING LUSTRE OF ARTIFICIAL SILK

1175 G.C., Banaras—Wishes to have a process of decreasing lustre of art silk.

Impregnate artificial silk fabric for 5 to 10 minutes in the following:—

Isobutyl alcohol	80	grams.
Neutral soap	2	"
Water	950	c. c.

After impregnation treat the cloth at 95°F for 5 to 10 minutes with:—

Neutral soap	3	grams.
Water	1000	c. c.

VANISHING CREAM

1196 J.S.M., Balaghat—Wants to have a good recipe of vanishing cream.

Stearic acid	200	gram.
Hard paraffin	10	"
Potassium hydroxide	15	"
Boric acid	2½	"
Water	700	c. c.
Alcohol 90%	20	"
Heliotropin	2	"
Anisic aldehyde	2	"
Xylene Musk	20	"

Melt the stearic acid on water bath and heat to 80°C. If the acid is not of the best quality pass it through a strainer to eliminate the foreign matters.

In another kettle warm a part of the water and put the alkali in it (and 15 c.c. glycerine when it is used). Heat to 80°C and pass through a strainer.

Heat the rest of the water to 80°C and maintain the temperature of the three at 80°C.

Pour the alkaline solution to the melted stearic acid gradually and stir briskly without taking away from fire.

Finally add the balance of the water and continue heating with stirring for about 10 minutes. Then add boric acid with stirring.

Now remove from the water bath to allow the mass to cool gradually. Continue agitation till a firm emulsion forms.

During cooling a crust forms on the top of the cream which is liable to create lumpiness. This is to be broken at intervals till room temperature is reached. Stir the mass every now and then for the first 12 hours.

The next day the mass will again harden. This is to be stirred again. Stir the mass for a few minutes every day for week.

Then add the perfumes dissolved in alcohol and stir. Allow the scent to mature for a fortnight. Then pack in narrow-neck bottles.

RUBBER SOLUTION

1143 C.M., Mbale, Uganda—Desires to know a process of making rubber solution.

Rubber solution is used in some quantity by the cycle and motor tyre repairer and also in various trades as a waterproof varnish. In order to prepare this article fresh raw rubber cut in small pieces is placed in a bottle of naphtha or benzine in the proportion of 1 part of the former to 5 of the latter. The rubber gradually swells, absorbing the solvent and eventually loses its tenacity. Now the mass being vigorously stirred or the bottle being shaken from time to time, an apparently homogeneous solution is finally obtained. This rubber solution is very sticky and tenacious. But if the raw rubber is not fresh it is better to masticate it in a kneading machine whereby it is reduced to impalpable paste. Now take one part of this paste and put it into 6 parts of naphtha or benzine contained in a suitable bottle. Shake for a while. This rubber more readily goes into solution into a less viscous mass than untreated rubber.

COPAL VARNISH

1228 S.S.A., Agra—Desires to know a process of preparing copal varnish.

Dissolve 1 part of camphor in 12 parts of ether. When the camphor is completely dissolved, add 4 parts of colourless and finely powdered copal. Place this mixture in a bottle and shake until the copal is swollen and partly dissolved, then add 4 parts of proof alcohol and ½ part of rectified spirit or turpentine; shake again sufficiently, and the varnish is ready for use. After the bottle has stood for several days, however, the varnish divides into two distinct strata; the lower richer in copal, but the upper finer and perfectly colourless. The upper layer is claimed to be a good varnish. The lower stratum may be again treated with camphor, etc.

LIQUID GOLD

1241 A.T.C., Firozabad—Wants to have a formula of making liquid gold.

Liquid gold may be prepared by a solution of gold in a mixture of hydrochloric and nitric acids, to which salammoniac and alembroth, a triple compound formed by salt and ammonia and corrosive sublimate, have been added. This solution of gold évaporates to the consistency of oil, and is then applied to the silver or nickel, both of which it blackens, but they appear gilded on being heated.

GILDING GLASS BANGLES

Glass bangles are gilded by blending powdered gold with gum water and a little borax, and applying the mixture by means of a camel hair pencil. Gold powder required for the purpose is prepared by rubbing down gold leaf with a little honey or gum water in a porcelain dish until the gold is completely transformed into powder, after which the honey or gum is washed away. The process may be re-

peated three or four times to obtain the desired effect. The painted bangles are then heated in an oven or furnace, by which means the gum is burnt, and the borax, vitrifying, cements the gold to the surface.

PURIFYING HONEY

1267 J.D.B.C., Ambala Cantt.—Wishes to have a process of purifying honey.

For 300 parts of fresh honey, t ce 875 parts of water, 150 parts of washed, dried, and pulverised charcoal, 70 parts of powdered chalk, and the whites of eggs 20 parts beaten into 90 parts of water. Put the honey and the chalk in a vessel capable of holding ⅓rd more than the mixture and boil for 3 minutes then introduce the charcoal and stir up the whole. Add the whites of the eggs while continuing to stir; and boil again for 3 minutes. Take from the fire, and after allowing the liquid to cool for a quarter of an hour, filter and to secure perfectly clear liquid again filter on flannel.

REVOLVING WHEELS

1287 S.K., Tanjore—Wants to know a process of making revolving wheels.

These are made by fastening 4 to 8 driving cases to a wooden wheel made for the purpose. The cases are usually ½" to ¾" in inside diameter, either chocked or rammed on a nipple with clay. They are papered and matched in the following manner. Take 6 or 8 small chocked cases ½" diameter. Ram 5 or 7 of them with the composition composed of saltpetre, 18 parts; sulphur, 2 parts; charcoal, 5 parts and gun powder, 12 parts. Fill up to within ⅜" of the card end then stop ends with ½" of some composition moistened with dextrine water and ram tight with solid rammer. The remaining case should be closed with clay. Now cut papering 2" longer than the case and cover in the regular way. Into the chocked end after priming, twist a piece of match 1½" long. A little gum on the side of case when it touches the rim of wheel will hold it more securely than were alone.

STORAGE BATTERY PLATES

1386 P.N.R., Bombay—Desires to be enlightened with a process of manufacturing storage battery plates.

Faure plates are made by casting grids of pure lead generally containing a large number of small pockets, into which the active material in the form of a paste is forced. The grids are so made that the active material is held firmly in position.

The positive plates are pasted with minimum of red lead mixed in sulphuric acid; the two combine and foam sulphate of lead and lead peroxide. These eventually set into a hard dry porous mass, which adheres to the grid.

The negative plates are pasted with litharge, a mixture of lead monoxide and sulphuric acid, which also forms lead sulphate. By this method a given quantity of spongy lead can be formed by a less expenditure of initial charging current. Faure plates when formed are similar to plates in a discharged condition and when a battery built with these plates is installed, the cells require to be charged at a slow rate, for 36 to 48 hours continuously.

The operation of pasting can be done either by hand or by machinery but the former method is more or less reliable. It is rather an important operation, and it is not by any means a thing that any man can do properly. Very divergent results may be obtained from plates pasted by different men with the same ingredients. The grids are laid flat on a glass slab and the paste, which is first brought to the right consistency, worked into them by means of a spatula. One side being done, the grid is turned over and the process repeated. It is, of course, important that there should be no spaces left unfilled.

TAMBUL BIHAR

1391 B.D., Meerut City—Wants to know a good formula of tambul bihar.

Liquorice powder	24	parts.
Pollen of keora	24	,,
Seed of cardamom major	3	,,
Seeds of cardamom major	3	,,
Cloves	3	,,
Cinnamon	3	,,
Rose water		q.s.

Mix the above ingredients together and macerate in a stone mortar with requisite quantity of rose water. Then add finely pulverised saffron 3 parts.

PAN MASHLA POWDER

Aniseed	2	tolas.
Coriander seed	2	,,
Cuminseed	1	tola.
Seeds of cardamom major	¼	,,
Seeds of cardamom minor	¼	,,

Bake the first three ingredients separately and then reduce them to fine powder. Also grind the cardamom seeds to powder. Lastly mix all.

PAN BILAS

Coriander seed	1	tola.
Aniseed	1	"
Parsley	1	"
Nutmeg	1	"
Ajawan	1	"
Saffron	1	"
Seeds of cardamom minor	1	"
Cloves	1	"
Dry rose petals	1	"
Chua	1	"
Camphor	1	"

Take one tola each of the ingredients excepting the last two and soak them in good rose water for 12 hours. Then bray them together to a paste form and incorporate chua and camphor.

NON-ALCOHOLIC HANDKERCHIEF PERFUMES.

1418 R.C.P., Hoshiarpur—Wants to know a few recipes of non-alcoholic handkerchief perfumes.

In preparing non-alcoholic perfumes terpineol and benzyl benzoate are generally employed as solvents for essential oils. A few reliable recipes follow:—

LILY OF THE VALLEY

Synthetic lily otto	50	parts.
Terpineol	40	"
Linalol	10	"
Synthetic musk crystals	2	"

Mix and put in stoppered bottle. Shake frequently until dissolved.

NARCISSUS

Synthetic narcissus otto	50	parts.
" rose otto	5½	"
" musk crystals	1½	"

Treat as above.

VIOLET

Benzyl benzoate	50	parts.
Heiko-velchen (violet)	13½	"
Iraldein	12½	"
Heiko-mugenol	2½	"
Synthetic musk solution	2½	"
Synthetic cassie otto	1	part.

Treat as above.

MUSK KETONE

1424 V.M., Nagpur—Wishes to have a process of preparing musk ketone and also imitation gold.

There are several processes of preparing ketone musk, of which the following is one of them:—

Meta cresol	1	kg.
Pseudobutyl alcohol	0.8	"
Zinc chloride	2.4	"

Put the mixture in a flask fitted with a reflex condenser and heated. When the reaction is complete pour the product into water. An oily substance is separated out. Take this out and purify by fractional distillation, when pseudotrelye cresol boiling at 230°—260°C. is obtained. Now dissolve this hydrocarbon in an equal weight of glacial acetic acid and mixed with 4·5 parts of fuming nitric acid. Allow the mixture to stand. To complete the reaction heat it gently on a water bath and then pour into water; the trinitro-product which is thus produced is converted in a salt and etherified by heating it with alkyl chloride. The crystals obtained to possess a powerful odour of musk.

IMITATION GOLD

Copper	90	parts.
Gold	2½	"
Aluminium	7½	"

Melt the copper and the gold in a crucible composed of refractory material or of a mixture of unburnt fire-clay and dust of fire bricks, glass pots or seggars and when the metals are fluid the aluminium is added. When not more than 2 lbs. of the alloy are made at a time the mass is kept in a fuse state for half an hour, about 1½ oz. of borax being added as a flux. The melted mass is then poured into ingots.

CHARCOAL TOOTH POWDER

1452 S.C.G., Kanpur—Wants good recipes of charcoal tooth powder and carbolic tooth powder.

Levigated charcoal	4	oz.
Heavy magnesia	8	"
Powdered sugar	4	"
Cream of tartar	1	"
Oil of peppermint	1	dram.

Mix and sift.

CARBOLIC TOOTH POWDER

Kaolin	12	oz.
Kieselguhr	4	"
Phenol	½	"
Powdered quillaia extract	2	dr.
Eosin	3	gr.
Otto of rose	10	mins.

Dissolve the eosin in water 2 dr. and triturate with 2 oz. of kaolin until well mixed. Mix the carbolic acid and otto with an ounce of kieselguhr by trituration, add to the coloured kaolin also add the rest of the powders, triturate and sift three times.

WASHABLE DISTEMPER

1471 N.C., Veraval—Desires to have good furmulas of distemper powders, etc.

Paris white	560	parts.
Zinc white	100	,,
Plaster of Paris	160	,,
White dextrine	39	,,
Gum acacia	16	,,
Borax	7½	,,
Alum	4½	,,

Mix.

1 lb. of this is to be mixed with a pint of ing water the mixture well stirred, and then ined with cold water.

ASTER OF PARIS

To manufacture plaster of Paris, grind sum to powder in a disintegrator. Then pass ugh a 100-120 mesh screen. Next calcine powder in an iron vessel with continuous ring at a temperature of about 120°C. ally pack the plaster of Paris in air-tight els either of tin or wood.

OURED FIRES

1490 S.R.M., Kumbakonam—Wishes to recipes of coloured fires.

GREEN

Barium nitrate	9	parts.
Potassium chlorate	3	,,
Shellac	1	part.
Dextrine	1/16	,,
Fine sawdust	½	,,

Mix and put in paper tubes.

RED

Strontium nitrate	16	parts.
Potassium chlorate	8	,,
Shellac	3	,,

Mix and put in paper tubes.

GENATED TOOTH POWDER

1519 S.C.G., Kanpur—Wishes to have a formula of oxygenated tooth powder.

Magnesium peroxide	10	parts.
Hard soap powdered	2½	,,
Menthol	1/10	part.
Oil of rose	1/5	,,
Oil of wintergreen	½	,,
Heavy chalk powder	900	parts.

Mix and sift three times.

MAKING

608 M.A.J., Samalkot—Desires to know a s of making gut.

The first stage in gut making consists in g the intestines from any adherent fatty rs, after which a number of ends are tied together and the major portion is left to lie in water for about two days, the water being meanwhile frequently changed, the object in view being to soften any mucous membranes so that they may be more readily removed by scraping. The gut is then sorted out and graded for different purposes. That which is intended for strings is put in a soution, consisting of 4 oz. of caustic potash and 4 oz. of carbonate of potash to each 4 gallons of water. They ought now to scrape quite clean from their inner mucous coat, and will consequently be much smaller in dimensions than at first. They may now be wiped dry, slightly twisted and passed through a hole in a piece of brass, to equalise their size. A number of pieces may then be spun together and left as they are if desired semi-transparent, or dyed in various colours. The gut, whilst still in a moist condition, takes dyes readily. As the guts dry, they are passed every two or three hours through other holes, each smaller than the last. When dry they will be round and well polished, and being oiled are fit for use

MENTHOL

1617 S.L.V.P., Sattur — Wants to have a process of preparing menthol.

Menthol crystals may be prepared by chilling peppermint oil derived from Mentha piperita plant. For this purpose put a quantity of peppermint oil in a glass vessel and then surround it completely with freezing mixture of salt and ice. As the temperature of the oil diminishes crystals of peppermint collect at the bottom of the vessel. These are then taken out, pressed in folds of blotting paper and kept in airtight bottles.

TWINE GLAZING

1696 A.T.C., Nagpur—Wants a process of glazing twine.

Glue	7	av. oz.
Glycerin	10	fl. oz.
Water		q.s.

Pour on the glue more than enough water to cover, allow to macerate for several hours, then decant the greater portion of water; apply heat until the glue is dissolved, and add the glycerin. If the mixture is too thick, more water may be added. It may be coloured by means of an aniline dye, dissolved in alcohol. The addition of a little claclum chloride also tends to prevent the glue from cracking. The twine to be sized to any desired colour may be rubbed with glue tinted with the dye by means of a sponge dipped in the glue.

—BRIEF QUERIES AND REPLIES

Questions of any kind within the scope of Industry are invited. Enquiries or replies from our experts will be published free of charge in serial order. Questions are replied by post on receipt of As. 8 stamps for each question. Subscribers outside India are requested to send two International Reply coupons for each question. In order to facilitate the work of Editor's Department and to help prompt action the readers are requested to send enquiries in separate letters.

3418 I.N.M., Surat—Following is a list of hosiery manufacturers: — Bombay Hosiery Works, Mogal Line, Lady Hardinge Road, Matunga, Bombay; Borivli Hosiery Mills, 63, Champa Gally, Bombay 2; Banga Lakshmi Hosiery Mills, 58-1A, Barrackpore Trunk Road, Calcutta; Kalighat Hosiery Factory, 231, Rash Behari Avenue, Calcutta; Kapoor Hosiery Factory Ltd., 8, South Sinthee Road, Calcutta and Kothari Hosiery Mills, 24, Chaulpatty Road, Calcutta 10.

3419 L.N.D., Bhagalpur—For lottery tickets enquire of Royal Calcutta Turf Club, 13, Russel Street, Calcutta.

3420 N.C.C.S., Ahmedabad—All the ingredients you require may be had of Banshidhar Dutt, 126, Khengrapatty Street, Calcutta,

3421 P.J.R., Gudivada—Fountain pens and accessories may be had of Anundo Chunder Ghose, B51 & 81, New Market; Dhar Bros., 82, Harrison Road; College Stores, 55, College St.; Pen & Pencil Agency, 77, Harrison Road and Sarada Agency, 87/1, College Street; all of Calcutta. For fountain pen engraving machine enquire of Oriental Machinery Supplying agency Ltd., P12, Mission Row Extension and International Trading Co., 13, Netaji Subhas Road; both of Calcutta.

3422 C.S., Samalkot—We have no book on mineral analysis. You may enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta and W. Newman & Co. Ltd., 4, Old Court House Street, Calcutta.

3423 P.I., Vijayawada—You may consult The Electrician by V. L. N. Row published from this office, price Rs. 6/7/- including postage

3424 Z.C.W., Bombay—Tin chloride may be prepared by heating tin in a current of hydrochloric acid gas; it fuses at 250° and boils at 606°. Please explain clearly what you mean by lead paper.

3431 M.J.P., Meerut City — Process of manufacturing all kinds of ink will be found in Manufacture of Ink published from this office, price Rs. 3/7/- including postage.

3434 A.K.R., Calcutta — An article on candle manufacture appeared in May, 1949, issue of Industry. If you go through the article you will get all the information required.

3435 N.A., Bannu—Process of manufacturing vegetable ghee will be found in Vegetable Oil Industry published from this office, price Rs. 3/7/- including postage. For manufacturing katha you may consult Manufacture of Catechu published from this office, price Rs. 3/7/- including postage. We have no book dealing with manufacture of ghee from animal fat.

3436 C.B., Bombay—All the addresses you require will be found in Industry Year Book and Directory. Addresses will be found under different caption such as cotton mills, jute mills, oil mills, sugar mills, etc., engineering workshop, electroplaters, etc.

3443 V.R., Singapore—There is no plastic factory in India manufacturing plastic articles and moulding powder also. You will require at least Rs. 25 lakhs for starting a plastic factory for manufacturing plastic powder and plastic articles from the above powder. Process of manufacturing anhydrous acetic will appear in Formula Section, in due course.

3444 S.B., Gurgaon—For the book you require you may enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta. Following is a formula of printing roller composition:—Glue 64 parts; Water 48 parts; Linseed oil 96 parts; Treacle 70 parts; Calcium chloride 8 parts; powdered rosin 8 parts. Soak the glue in the water and then liquefy by heat. Then stir in the oil, first heated to 150°F. Then add the treacle and calcium chloride and finally the rosin in melted condition. The latter ingredient is only to be added when very tough rollers are required.

3445 G.S., Srinagar—Sodawater making machines may be had of Essence and Bottle Supplying Agency, 14, Radha Bazar Street, Calcutta.

3446 M.G.W., Farrukhabad — Process of manufacturing rubber stamp will be found in Manufacture of Rubber Goods published from this office, price Rs. 3/7/- including postage. Rubber stamp making materials may be had of B. Goray & Co., 156, Cornwallis Street, Calcutta.

3447 A.G.A., Banaras—Tallow may be had of Calcutta Tallow Supplying Co., 19, Tiretta Bazar Street and Indian Tallow Supplying Co., 21, Tiretta Bazar Street; both of Calcutta.

3448 S.N.C., Koraput—Gold and silver may be had of Prosad Das Boral & Bros., 28, Swallow Lane; Naba Kishan Dey & Bros., 8, Nalini Sett Road; and Akhoy Kumar Dey & Co., 54, Monohar Das Street; all of Callutta.

3449 P.R., Rajnandgaon—For books on biscuit manufacture you may enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta.

3450 T.B., Secunderabad — Vernacular equivalent of ingredients is not available. All the ingredients are available from Banshidhar Dutt, 126, Khengrapatty Street, Calcutta. We have no higher book on varnish manufacture. You may enquire of Thacker Spink & Co. (1933), Ltd., 3, Esplanade East, Calcutta for a book on varnish manufacture.

3451 B.N.R., Rohini—For the books you require enquire of Gurudas Chatterjee & Sons, 203-1-1, Cornwallis Street and Hindi Pracharak Pustakalaya, 195/1, Harrison Road, both of Calcutta.

3456 S.S.C., Bombay—Following is a formula of dye soap:—Dye soap is prepared by taking 1 lb. of common soap, mixing with it aniline 1 dr. and dissolving it in 2 oz. of gur and 2 oz. of water, then working up the mass in a clear paste and moulding it to the desired shape with stamps on.

3458 I.N., Surat—Refer your query to Commerce Ministry, New Delhi.

3459 S.S., Jullundur City—Wire nail making machines may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

3460 H.L., Muzaffarpur—Plastic powder may be had of Imperial Chemical Industries (India) Ltd., 18, Strand Road, Calcutta.

3461 V.N.S., Shencottah—In order to prepare chicory, cut into slices the fresh root of wild succory or Cichorium Intybus and expose it to heat in iron cylinders along with about 1½ per cent to 2 per cent of lard. Stir the slices frequently with ladle and remove them when they have been sufficiently fried. Now allow the slices to cool and afterwards grind them into powder in a mill.

3462 W.N.S., Delhi—Following is a formula of toffee:—Sweetened condensed milk 3 lbs.; full cream milk 1 quart; sugar 3½ lbs.; glucose 4 lbs.; butter ½ lb.; vanilla and salt to flavour. Cook to crack all the ingredients together in an earthenware vessel or enamel except the last two. Then add the butter and vanilla essence. Finally cut in cubes of required size and wrap in paper.

3463 J.P.R., Jamshedpur — For cardboard you may enquire of D. J. Banerjee, 86B, Netaji Subhas Road, Calcutta and India Paper & Board Mills Co. Ltd., 71, Satgachi Road, Dum Dum.

3464 S.M.D., Bashirhat—For rice milling machines you may enquire of General Rice Machinery Stores, 85A, Netaji Subhas Road, Calcutta and Machinery Supply Agency, 40, Strand Road, Calcutta.

3465 G.T.R., Guntur—For laundry machine you may enquire of Jessop & Co. Ltd., 93, Netaji Subhas Road, Calcutta and Larsen & Tubro Ltd., Royal Exchange Place, Calcutta. Estimate for starting a factory will be supplied by the above firms.

3466 R.K.K.M., Jodhpur—We cannot supply you any technical expert who can teach you manufacture of ultramarine blue. You should advertise in newspapers for securing an expert.

3467 S.K.J.B., Tinsukia—To convert inferior sugar into refined crystalline white sugar it is boiled with water and the syrup is clarified with milk till a perfectly clear syrup is obtained, which is then concentrated by continued boiling till the right consistency is attained. When ready to crystallise, the syrup is thinner than that of the cane juice rab and the state is easily determined by the expert eye of the boiler. The hot liquid is transferred into a round iron pan in which it is "aired" in order to favour crystallisation as soon as the fine crystals become visible the mass is transferred to suitable vessels to coil and crystallise further. After two or three days to crystallise the material is ready to be treated in the centrifugal. The sugar mass is tipped into an enamelled basin or brass or copper vessel, the hard lumps are broken with a wooden peg unless there is a pug mill for that operation, and put into the basket of the centrifugal. mixed, if necessary, with syrup eliminated from a previous charge to facilitate the machinery.

3478 V.G.L., Ahmednagar — Toffee making machine may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta.

3479 K.K.I., Kanpur—For transfers you may enquire of Signograph Co., Baranagar, Near Calcutta.

3480 A.P.W., Muthialpet—For screen printing you may enquire of Bharat Laxmi Press 92, Princess Street, Bombay 2 and Bombay Fine Art Offset & Litho Works, Sussex Road Victoria Gardens, Bombay 27.

3481 K.A., Guntur — Envelope making machine may be had of John Dickinson & Co., 6, Clive Row, Calcutta.

3482 K.S., Darbhanga — Perfumery raw materials may be had of F. N. Sarkar, 37, Canning Street; Paradise Perfumery House, 7, Colootola Street; Essence Supply Agency, 6, Colootola Street and Ghose Bros., 50, Ezra St. all of Calcutta.

3483 C.D., Darbhanga—Matches may be had of Western India Match Co. Ltd., Wellesly House, 7, Wellesley Place, Calcutta 1. Address of Lever Brothers Ltd., is 4, Lyons Range, Calcutta 1. For Cycles enquire of Bentinck Cycle Co. Ltd., 1-2, Chowringhee Road; Bimal Bros., 1-B, Chowringhee and H. D. Nandy & Co., 50-6, Dhurumtola Street; all of Calcutta.

3488 M.W.F., Kadugannawa — All the chemicals you require may be had of Calcutta Mineral Supply Co. Ltd., 31, Jackson Lane and Calcutta Chemical Co. Ltd., 10, Bonfield Lane; both of Calcutta.

3489 P.V.R.R., Jalarpet—For alcohol you may write to the Excise Department of your district. For plastic powder write to the Imperial Chemical Industries (India) Ltd., 18, Strand Road, Calcutta. Now it is possible to manufacture plastic articles on small scale.

3490 A.S.S., Katrasgarh — Distributor of Nestle's Milk product is Nestle's Products (India) Ltd., 7, Hare Street, Calcutta and Distributor for Horlick's Malted Milk is J. F. Cronin, Post Box 2229, Calcutta.

3491 P.K.J., Ajmer—Process of manufacturing hand paper from hosiery waste will appear in Formula Section in due course.

3493 D.A., Calcutta — Following is a list of tea planters: Basmatia Tea Estate Factory, Dickom, Lakhimpur; Behora Tea Estate Factory, Numaligarh, Sibsagar; Chincooria Tea Estate Factory, Silchar, Cachar and Dalmukhia Tea Estate Factory, Mariani, Sibsagar. An exhaustive list will be found in Industry Year Book and Directory published from this office, price Rs. 16/4/- including postage.

3495 T.B.P.S., Secunderabad—Vernacular equivalents of the ingredients are not available. All the ingredients may be had of Banshidhar Dutt, 126, Khengrapatty Street, Calcutta. For a book on varnish manufacture you may enquire of Thacker Spink & Co. (1933), Ltd., 3, Esplanade East, Calcutta.

3507 D.R.B., Chaibasa—In order to remove the defect of soap reduce the quantity of of dye used in soap.

3508 S.B., Simla—Plastic machines may be had of Francis Klein & Co. Ltd., 1, Royal Exchange Place, Calcutta and Alfred Herbert (India) Ltd., 13/3, Strand Road, Calcutta.

3510 H.L., Fatehgarh—Paddy husk may be used as slow burning fuel.

3511 V.Z.G., Bombay—Formula of bakelite powder will appear in Formula Section in due course.

3512 M.M.P.R.N., Tinnevelly—For plastic goods enquire of Basak Brothers, 20, Raja Manindra Road, Calcutta 37 and Basant Plastic Industries, 22A, Anath Nath Deb Lane, Calcutta 37.

3509 K.C.K., Sohawal—You should apply the silvering solution on the glass. You should arrange some mechanical device. You may consult Apprentice Shop Practice by M. N. Swami published from this office, price Rs. 6/- including postage.

3513 A.I.T.C., Agra—For shellac you may enquire of A. M. Arathoon Ltd., 11, Stephen House, Dalhousie Square, Calcutta; Angelo Bros. Ltd., 6, Lyons Range, Calcutta and Tollygunge Shellac Factory, Hathibari, Tollygunge, Calcutta.

3514 S.S.K., Muradabad—Following is a formula of Slate Pencil:—Ground slate 60 parts; ground limestone 30 parts; silicate of soda 10 parts. Knead the ingredents together into a plastic mass and then force through a perforated steel plate. The pencils are next cut into desired sizes when dry. Process of manufacturing steel slate appeared in December 1949 issue of Industry.

3515 K.C.W., Agra—Process of manufacturing all kinds of fountain pen ink will be found in Manufacture of Ink published from this office, price Rs. 3/7/- including postage.

3516 A.M.G.M., Calicut—Envelope making machines may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

3530 R.D., Sarupeta—Refer your query to Industry Ministry, New Delhi.

3531 H.S.M.S., Madanfura — No machine is used in manufacturing biris; no machine is available.

3532 O.P., Kanpur—Following is a formula of soap powder:—Yellow soap 6 parts; soda crystals 3 parts; pearl ash 1½ parts; sulphate of soda 1½ parts; palm oil 1 part. Mix the ingredients in a specially adopted mixer for heavy material until dry and then run directly to the crusher and pulveriser.

3533 K.S.F., Haldwani — For lard and tallow enquire of Calcutta Tallow Supplying Co., 19, Tiretta Bazar Street and Indian Tallow Supply Co., 21, Tiretta Bazar Street; both of Calcutta.

3534 S.V., Wardha —Naphthalene may be had of H. Momtaz & Co., 1, Colootola Street, Calcutta. Aluminium sheet may be had of Aluminium Corporation of India Ltd., 9, Netaji Subhas Road, and Indian Aluminium Co. Ltd., 5, Council House Street; both of Calcutta.

3535 H.C.I., Srinagar—You may add ½ part methyl violet with methylene blue to improve the quality of ink tablet.

3536 N.N.S.P., Trivandrum — Process of manufacturing slate pencil will be found under No. 3514 above.

3537 H.G.S., Imphal—Iron pans are made by casting and by hammering iron sheets. If you wish to manufacture iron pan by casting you have to invest at least Rs. 25,000/-. In this connection you may consult Practical Metal Casting by D. Dey published from this office, price Rs. 3/7/- including postage.

3538 K.D., Ajmer—For electric motors you may write to Biswas Trading Co., 55-58, Ezra

Street and General Electric Co. (India) Ltd., Magnet House, Chittaranjan Avenue; both of Calcutta. In cough lozenges you may use liquorice. Betal leaves yield essential oil when distilled.

3539 L.J.M., Chikmagalur — For mantle write to B. K. Shaw, 3, Beadon Street, Calcutta; Bengal Scientific & Technical Works Ltd., P513, Rash Behari Avenue, Calcutta; Abbas & Co., 313, Abdul Rehman Street. Bombay 3 and Hind Mantle Works, Love Lane, Byculla, Bombay 27.

3540 G.L.M., Kalyan—An article on incandescent mantle manufacture appeared in December 1949 issue of Industry.

3541 M.L.C., Shillong—There is no such institution where practical training is given in fruit juice preservation, bottling and canning. Machines you require may be had of International Trading Co., 13, Netaji Subhas Road; India Machinery Co. Ltd., 29, Strand Road; Jessop & Co. Ltd., 93, Netaji Subhas Road and Ivan Jones Ltd., 8, Dalhousie Square, all of Calcutta.

3551 J.J.G.C., Bombay—An article on gas mantle manufacture appeared in December 1949 issue of Industry.

3552 C.R.S.M., Chitaldrug—We have no book on uses of soft wood. For a list of books on essential oils enquire of Thacker Spink & Co. (1933) Ltd., 3, Esplanade East, Calcutta.

3553 B.O.H., Madras — For lens grinding machine enqire of J. Sur & Company, 3, Dalhousie Square East; and James Murray & Co. Ltd., 5, Old Court House Street; both of Calcutta.

3556 A.T.C., Firozabad—For liquid gold write to Baker Platinum Ltd., 52, High Holborn, London W. C. 1. and Johnson Matthew & Co. Ltd., 73-83, Hatton Garden, London E.C.I. Process of manufacturing liquid gold will appear in Formula Section in due course.

3558 V.C., Ajmer—Process of manufacturing rubber stamp will be found in Manufacture of Rubber Goods published from this office, price Rs. 3/7/- including postage.

3559 J.K.N., Karimganj—All informations regarding slate manufacture will be found in Manufacture of School Slate by Durga Pershad published from this office, price Rs. 1/15/- including postage.

3560 M.A.C.S., Nigeria—For yarn enquire of Vadilal Dolatram & Sons, 14, Hanuman Bldg., Tamba Kanta, Bombay; Popatlal Girdharilal & Co., 49, Apollo Street, Bombay and P. N. Mehta & Co., Cook's Bldg., 324, Hornby Road, Fort, Bombay. Following is a list of herbs and drugs dealers: Banshidhar Dutt, 126, Khengrapatty Street: Dawn & Co., 11, Portuguese Church Street and P. C. Dawn & Co., 1, Mechuabazar Street: all of Calcutta. You may consult Indian Perfumes, Essences and Hair Oils published from this office, price Rs. 3/7/- including postage.

3569 K.H., Muzaffarpur — For rubber enquire of Anant Lall Shaw, 4, Moti Sil Street; Central Stores, 2, Moti Sil Street and Empire Stores, 2, Moti Sil Street; all of Calcutta. Fo[r] lace write to Ideal Lace Industries, Narsapu[r] W. Godavari and National Lace Manufacturin[g] Co., Narsapur, Godavari.

3570 S.W., Madras—Process of refinin[g] vaseline will appear in Formula Section in du[e] course.

3571 J.A.A.S.C., Portonovo — The groun[d] nut oil as expressed from the seed is liable t[o] contain mucilage and albuminous matter which produce turbidity in the oil. In orde[r] to remove these impurities filter the oil throug[h] filter press, but before doing so treat the o[il] with 10 per cent of its weight of fuller's ear[th] which should be dehydrated by roasting pri[or] to use. Mix thoroughly and then heat th[e] mixture to 100°F and maintain the tempera[ture] constant for about 15 minutes. Lastl[y] filter the oil through filter press. Thus clear oil is obtained. Ghee flavour may be ha[d] of Paradise Perfumery House, 7, Colootola St[reet,] Calcutta.

3572 M.V.S., Siwan—Refer your query t[o] Indian Optical Institute of Refraction & Hosp[i]tal, 7-1C, Lindsay Street, Flat B2, Calcutta.

3573 M.P.Y., Palank—Address of India[n] Farming is "P" Block, Raisina Road, Ne[w] Delhi.

3574 K.L.D., Bombay—Following is th[e] process of making vegetable tallow:—Vegetab[le] tallow is made from various plants particularl[y] from vateria indica or dhupa trees, which for[m] evergreen forests at the foot of the Wester[n] Ghats. In obtaining this fat the kernel of th[e] seeds are reduced to powder. Then this [is] boiled in water for a long time. After this th[e] fire is put out and the extract is allowed to coo[l] when the fat is found to float on the surface [of] the water. This is then skimmed off and kep[t] in a cool place to solidify. Following is formula of thinner:—Butyl acetate 8 per cent acetate ether 14 per cent.; toluol 58 per cent methylated spirit 20 per cent. Mix. Followin[g] is a formula of lacquer: Acetone 25 parts; buty[l] acetate 30 parts; acetic ether 25 parts, tolu[ol] 15 parts; nitro-cellulose 100 parts; castor o[il] 10 parts. Mix.

3584 K.C.S., Bond Bareta—For sellin[g] minerals you may negotiate with the followin[g] firms: E. G. Achesen Ltd., 9, Gaya Free Stree[t] London S.W.I.; Booren Thomas & Co., Ltd 89-9, Crescent Lane, London S.W.4: and Exer & Co., Ltd., 40, Chapel Street, Liverpool. A[d]dresses of Germany are not available.

3585 S.K.S., Delhi—For the books require[d] enquire of Thacker Spink & Co. (1933), Ltd 3, Esplanade East and W. Newman & Co., Ltd 3, Old Court House Street; both of Calcutta.

3586 H.D.M., Jharia—You may enquire [of] Jessop & Co., Ltd., 93, Netaji Subhas Road, R. Alcock & Co., P-12, Mission Row Extension an[d] T. E. Thomson & Co., Ltd., 9A, Esplanade Eas[t] all of Calcutta.

3587 S.K.B., Asansol—Saltpetre earths a[re] found in various parts of India chiefly in th[e] United Provinces and Bihar which are the mo[st] important ones in this respect, and whenc[e] nearly all the natural saltpetre is still derive[d]

The material is mostly a product, continually reformed by the action of atmospheric air upon nitrogenous organic matter in the presence of bases, such as lime magnesia and potash. Saltpetre earth is chiefly found in the neighbourhood of village where urine etc., yields abundant supply of organic nitrogen. In Bihar it is collected from the soil by scraping off the upper most layers which show a white efflorescence.

3588 P.T.M., Mysore—We are not aware of any such book.

3589 P.V.P., Quilon—Following is a list of dealers in herbs: Banshidhar Dutt. 126, Khengrapatty Street; Indian Herbs Store, 31, Mallick Street and Dawn & Co., 11, Portuguese Church Street; all of Calcutta.

3590 S.K.I., Bangalore—You may consult Manufacture of Soap published from this office price Rs. 4-7 including postage. Formulas of ink of all description will be found in Manufacture of Ink published from this office price Rs. 3-7 including postage.

3591 R.M.D., Raipur—Boil tamarind seed starch and sugar dissolved in sufficient water for some time. When this will be transparent and of required consistency add salicylic acid as preservative.

3592 A.S.I.S., Harohalli—Your enquiry appears in Trade Enquiry columns.

3593 N.S., Fatehgarh—You may start mother of pearl buttons with Rs. 2,000. For machines you may enquire of Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension, Calcutta.

3594 G.G.B., Bombay—Following is a formula of hair dye: Metol 10 parts, amidophenol 3 parts; monoamidophenylamine 6 parts; rectified spirit 500 parts; sodium sulphite 5 parts: Dissolve the sulphite in alcohol and then introduce the other ingredients and stir until dissolved. Wash the hair first with soap and then mix a quantity of dye with equal amount of hydrogen peroxide, and apply to the still moist hair by means of a fine cloth. Following is a formula of soap powder: Yellow soap 6 parts; soda crystals 3 parts; pearl ash 1½ parts; palm oil 1 part. Mix the ingredients in a specially adopted mixer for heavy material until dry and then run directly to the crusher and pulveriser.

3595 B.D.S.C., Simla—For embroidery labels enquire of R. G. Pal & Co., 110-2, Grey Street, Calcutta.

3596 K.S.W.F., Jhansi—All the ingredients you enquire may be had of Banshidhar Dutt, 126, Khengrapatty Street, Calcutta. In order to reduce the cost of production of dhoop you may omit musk in the formula.

3597 C.A.N., Bodinayakanur—Following is a recipe of bedbug exterminator. Insect powder 15 parts; colocynth 15 parts; phenol 5 parts; oil of turpentine 10 parts; alcohol 100 parts. Macerate the crude drugs in the alcohol for 8 days, express and filter, then add the oil and phenol.

3598 P.C.G., Bulandshahr—Following is a recipe of blood purifier: Potassium iodide 8½ oz; potassium bicarbonate 4 oz.; sassafras oil 1 dr.; spirit vini. rect. 4 dr.; chloroform water 8 dr. Dec. sarsae co. con. 15 oz.; distilled water to make 80 oz. Mix. De. sarsaparilla Co. used above may be prepared thus: sarsaparilla cut transversely 22½ oz; sassafras root in chips ½ oz; guaiacum wood dust ½ oz.; dried liquorice root bruised ½ oz.; mezerion bark ¼ oz.; boiling distilled water 1½ pint. Infuse for one hour then boil for 10 minutes in a covered vessel cool and strain, pouring water over the contents to make 1 pint.

3599 T.K., Delhi—If you use expeller you may obtain more oil from mustard seeds.

3600 U.S.P., Rai Bareli—Carbolic acid in the fountain pen ink formula should be 7 grains.

3601 M.S.F., Ranchi—A formula of good disinfecting fluid appeared in April 1949 issue of Industry.

3602 G.V.N., Ambajepeta—We are not aware of any chemical which will freeze white oil like coconut oil. If you mix a small quantity of coconut oil to white oil the mixed oil will smell like coconut oil. You have to refine the second quality coconut oil.

3617 V.K.P., Tirunelveli—Process of manufacturing table salt and magnesium salt will appear in Formula section in due course.

3618 V.I., Kaithal—An article on plastic industry appeared in December 1948 issue of Industry.

3619 K.V.K., Cheerala—For gold cutting lathe enquire of A. Sur & T. Dass Co., 23[illegible] Upper Chitpur Road, Calcutta 3.

3620 I.K.I., Saharanpur—For coconut fibre write to Aspinwall & Co., Ltd., Cochin and East India Exporting Co., Vaikuntapuram, Foulson Rd., Rajahmundry.

3621 R.C.I., Ludhiana—For calcium carbide enquire of K. C. Dey & Sons, 161-1, Harrison Road; Radhakanta Dass & Sons Ltd., 21 Old China Bazar Street: all of Calcutta; Saccharine and fruit essence may be had of Essence & Bottle Supply Agency, 14, Radha Bazar Street, Calcutta.

3622 T.S.V., Muzaffarpur — For taking agency you should advertise in newspapers. For Kelly's Directory write to Thacker Spink & Co. (1933), Ltd., 3, Esplanade East, Calcutta. For Government publications write to Government of India, Central Publication Depot, 8 Hastings Street, Calcutta.

3623 R.C.C., Banaras—For cream separation and other appliances enquire of Edward Keventers Ltd., 11-3, Lindsay Street, Calcutta. Process of manufacturing milk powder will be found in Milk and Milk Products published from this office, price Rs. 3-7 including postage.

3624 C.R.G., Channapatna—Addresses of tin toy manufacturers of Japan are not available.

3644 H.S.M., Amritsar—Formulas of hair fixer, face powder, talcum powder, face cream etc. will appear in Formula section in due course.

3645 U.T.F., Cuttack—For type metal enquire of Heatly & Gresham Co., Ltd., 6, Mission Row, Binoy Metal Works Ltd., 43, Strand Rd.,

both of Calcutta and Nonferrous Metal Reginery, 5, Chintamani Temple Bldgs., 2nd Bhoiwada, Bombay 2.

3646 R.P.J., Muzaffarpur—For hosiery knitting machine enquire of W. H. Brady & Co., Ltd., Mercantile Bldg., Lall Bazar, Calcutta.

3647 I.N.U., Surat—You may consult Industry Year Book and Directory published from this office, price Rs. 16-4 including postage.

3648 S.R.S., Ahmedabad—A good formula of pain balm appeared in May 1948 issue of Industry.

3649 R.P.M., Jahanabad—It is not possible to manufacture batteries on small scale as cottage industry basis.

3653 O.S., Dharmapuri—Plastic goods may be had of Basak Brothers, 20, Raja Manindra Road, Calcutta 37; Basanti Plastic Industries, 22A, Anath Deb Lane, Calcutta 37 and Plastics Moulds Ltd., 38, Netaji Subhas Road, Calcutta —1. You may start ink manufacture with Rs. 100 as initial capital.

3654 I.B.S., Nellore—It is not possible to manufacture films for cinemas on cottage industry basis. Films are not manufactured from Mica.

3655 B.P.A., Jahangirabad—Process of manufacturing all kinds of soap will be found in Manufacture of Soap published from this office price Rs. 4-7 including postage.

3657 S.R.K., Bangalore—For selling woollen goods you may advertise in newspapers.

3658 M.C., Meerut—Ink manufacturing materials may be had of Banshidhar Dutt, 126, Khengrapatty Street, Calcutta. Plastic machines may be had of Francis Klein & Co., Ltd., 1, Royal Exchange Place, Calcutta. For candle manufacture hard paraffin and wicks are required. Candle have good prospect as kerosene oil is not available. Attempts should be made to sell candles in rural area where kerosene oil is difficult to obtain.

3659 E.E.T.C., Mathurai—For colour spraying machine enquire of Akhoy Kumar Laha, 1, Dharamtola Street, and B. K. Dutt & Co., 35, Netaji Subhas Road; both of Calcutta.

3660 S.G.B.J., Beawar—Wants to be put in touch with the button dealers in Calcutta, Ceylon and Manila. Nut buttons are coloured with "resist dye". In order to bring out the colour and finish the buttons are put into polishing drums.

3661 E.T.T., Oloor—We are not aware of any machine dealers that deal in cracker making machine. You may however enquire of Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension, Calcutta.

3662 M.S.F., Baramati—You may enquire of local post office regarding sending articles to Thailand.

3674 A.K.G., Mathurai—In silvering mirror two solutions are required namely reducing solution and silvering solution. Following is a formula of reducing solution. In 1 oz. of distilled water dissolve 12 gr. of rochelle salts and boil; while boiling add 15 gr. of silver nitrate dissolved in 1 oz. of distilled water and continue boiling for 10 minutes more; then add more distilled water to make 12 oz. Following is a process of making silvering solution: Dissolve 1 oz. of silver nitrate in 10 oz. of distilled water, then add liquid ammonia until the brown precipitate is nearly, but not quite, all dissolved then add 1 oz. of alcohol and sufficient water to make 12 oz. To silver take equal parts of the two solutions and mix thoroughly and lay the glass face down, on top of the mixture while wet after it has been carefully cleaned with soda and well washed with clean water. About 2 dr. of each will silver a plate 2 inches square. The dish in which the silvering is done should be only a little larger than the plate. The solution should stand and settle for 2 to 3 days before use and will keep good for a long time.

3675 S.M.S., Amraoti—Process of manufacturing P.O.P. paper will appear in Formula section in due course.

3676 S.R.A., Lalpet—Following is a list of leather dealers: A. V. Mohamed & Co., 247, Angappa Naick Street; Hussain & Co., 6, Stringers Street and South Indian Export Co., Ltd., 4, McLean Street; all of Madras.

3677 A.V.M.C., Madras—Electric bulbs may be had of Bengal Lamp, 26-A, Ashutosh Mukherjee Road. Bharat Electric Bulb Works Ltd., 1-1, Umakanta Sen Lane; Calcutta Electric Lamp Works Ltd., 86-1, Bahirsura Road, Beliaghata and Kaycee Industries Ltd., Bharat Bhavan, 3, Chittaranjan Avenue; all of Calcutta. Rubber goods may be had of K. R. Lynch & Co., 113, Chittaranjan Avenue; Medical Rubber Goods, 3, Moti Sil Street, and Indian Scientific Stores, 142, Old China Bazar St.; all of Calcutta.

3678 J.N.M., Surat—Following is a list of cinema film distributors: British Distributors (India), Ltd., Dhan Nur Bldg., Sir P. Mehta Road, Fort, Bombay; Evergreen Pictures, Saklat House, 15, Queen's Road, Bombay; Paramount Films of India Ltd., Hague Bldg., Ballard Estate, Bombay; Twentieth Century Fox Corp. (India), Ltd., Leslie House, 19, Chowringhee, Calcutta and Associated Distributors Ltd., 32-A, Dharamtola Street, Calcutta. For selling brocades, Benarsi saries, gold and silver thread you should advertise in American papers.

3679 K.S.V., Muzaffarpur—For ice cream plants enquire of Refrigeration & Air Conditioning Industries Ltd., 34, Ezra Street, Refrigerators (India), Ltd., 59-C, Park Street and M. S. Vernal & Co., Bharat Insurance Building, Chittaranjan Avenue, South; all of Calcutta.

3680 A.H.G., Dhrapha—Unscented snow in lump is not available in the market. Please seek legal advice. Perfumery raw materials may be had of B. C. Patel & Co., 143, Princess Street, Bombay 2; P. Muncherjee & Co., 10, Hamam Street, and Perfumery Ingredients Co., 31, Mangaldas Road, Market; all of Bombay; Reel making machine may be had of Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension, Calcutta; Labels may be had of R. G. Pal & Co., 110-2, Grey Street,

Calcutta and Bharat Laxmi Press, 92, Princess Street, Bombay. Following is a formula of depilatory powder: Barium sulphide 20 grains; soap powder 5 grains; talc powder 32 grains; wheat flour 32 grains. Benzaldehyde enough to perfume.

3682 H.R.C., Agra—For strap cutting machine enquire of Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension, Calcutta.

3683 D.K. Aligarh—Address was printed by a duplicator machine which may be had of Gestetner (India), Ltd., 32, Grosvenor House, Old Court House Street, Calcutta.

3684 M.L.D., Agra—Process of manufacturing all kinds of soap will be found in Manufacture of Soap published from this office, price Rs. 4-7 including postage.

3685 N.L.B., Bantval—Following is the process of removing silver from mirrors: Hydrochloric acid 1 oz.; nitric acid 1 oz.; water 5 oz. Dip the mirror in this solution for about three to five seconds and the silvering will be completely removed. Next rinse glass in an acid-neutralising bath of cyanide potassium (10 p.c. solution). Then rinse with running water and dry. Following is a formula of glass cement: Isinglass 1 oz.; distilled water 6 oz.; boil to 3 oz.; and add 1½ oz. of rectified spirit. Boil for a minute strain and add, while hot, first ½ oz. of a milky emulsion of ammonia and then 5 dr. of tincture of mastic.

3686 P.K.R.N., Ganjam—Following is a list of jute brokers: A. M. Main & Co., Allahabad Bank Bldgs., 6, Royal Exchange Place; B. Meyer & Co., Ltd., 8, Netaji Subhas Road and J. Thomas & Co., 8, Mission Row; all of Calcutta. For terms of business you may correspond direct with them.

3687 A.E.C., Calcutta—We have no book on salt and rope manufacture. We have also no book dealing with steel pipe fittings manufacture. For machines you may enquire of Francis Klein & Co., Ltd., 1, Royal Exchange Place, Calcutta.

3688 P.L.S.C., Bulandshahr—Following is the process of blueing gun barrels: Lead acetate 500 gr.; sodium theosulphate 500 gr.; water q.s. Dissolve the solids in water. Warm the solution near its boiling points. Then immerse the gun in it. A variety of colour is obtained and as soon as the pale blue stage is reached the steel is taken out of the liquid and washed. We have no book on fire arm manufacture.

3707 D.R.S., Sumerpur—Confectionery machines may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta.

3708 S.C.S., Tezpur—Sheet metal working machine may be had of Alfred Herbert (India). Ltd., 13-3, Strand Road, Calcutta. We have no book on bucket manufacture. For iron pan making machines enquire of Francis Klein & Co., Ltd., 1, Royal Exchange Place, Calcutta.

3709 S.B., Simla—Machines required for plastic goods manufacture may be had of Francis Klein & Co., Ltd., 1, Royal Exchange Place, Calcutta.

3710 S.K.C., Howrah—In order to prepare rubber solution raw rubber cut in small pieces is put in a bottle of naphtha or benzine in the proportion of 1 part of the former to 5 of the latter. The rubber gradually swells absorbing the solvent and eventually loses its tenacity. Now the mass on vigorously or the bottle on shaking at a certain stage and this treatment repeated from time to time an apparently homogeneous solution is finally obtained. This rubber solution is very sticky and tenacious. But if the raw rubber is not fresh it is better to masticate it in a kneading machine whereby it is reduced to impalpable paste. Now take one part of this paste and put it into 5 parts of naphtha or benzine contains in a suitable bottle shake for a while. The rubber readily goes into solution into a less viscous mass than untreated rubber.

3711 M. G., Tinsukia—Plastic goods manufacturing machines may be had of Francis Klein & Co., Ltd., 1, Royal Exchange Place, Calcutta.

3712 R.S.G., Delhi—You may start a plastic factory on small scale. For machine you may enquire of Francis Klein & Co., Ltd., 1, Royal Exchange Place, Calcutta. For plastic powder enquire of Imperial Chemical Industries (India). Ltd., 18, Strand Road, Calcutta. Details regarding machines, cost of production etc., will be supplied by the machine suppliers.

3713 H.J., Avadi—For umbrella fittings write to Gambhir Chand Rathe, 39, Armenian Street, Joy Hind Stores, 40-1, Netaji Subhas Road, and Sohanlal Mohanlal Ltd., 5, Lucas Lane; all of Calcutta. We have no book on umbrella manufacture. A bulletin on umbrella manufacture was published by Director of Industries, West Bengal, 7, Council House Street, Calcutta. For steel shoes and nails making machines you may enquire of Francis Klein & Co., Ltd., 1, Royal Exchange Place, Calcutta. No details regarding razor blade manufacture are available.

3714 D.V.K., Amadalavalasa—For the machine required enquire of Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension, Calcutta.

3715 L.R.S., Calcutta—Details regarding formica are not available.

3716 V.K.M.S.M., Dindigul—For cardboard boxes write to S. Antool & Co., Ltd., 91, Upper Circular Road; Bengal Cardboard Industries & Printers Ltd., 165, Cornwallis Street and H. L. Sett & Sons, 21, Jadu Pandit Road; all of Calcutta.

3717 J.T.Y., Ajmer—All the addresses will be found in Industry Year Book & Directory published from this office, price Rs. 16-4 including postage.

3718 S.S.P., Singapore—You cannot buy anything from India by V.P.P.

3719 A.S.R., Chirala—Soap making machines may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta. Soap making materials may be had of Calcutta Mineral Supply Co., Ltd., 31, Jackson Lane, Calcutta.

3721 N.N.N.R., Madras—Artificial gem manufacture has good prospect. You may start this industry with Rs. 50,000 as initial capital.

3722 J.C., Poona City—For selling honey you may advertise in classified Bargain pages of Industry.

3723 A.S.A., Delhi—For manufacturing foot rules you should cut steel sheets of measured length and stamp and print, according to required design. We have no book on foot rule manufacture.

3724 K.S.R., Bangalore City—Knitting machines may be had of W. H. Brady & Co., Ltd., Mercantile Bldg., Lall Bazar, Calcutta. Following is a formula of blanco: Whiting or China clay 74 parts; glue 1 part; water 25 parts; green pigment colour q.s. Water is warmed to about 176°F. and the powdered glue is stirred in until dissolved. The whitings and colour are then added slowly with constant stirring after the source of heat has been removed and to each 100 lbs. of mixture 8 oz. of sodium silicate are added to prevent decay of the glue during subsequent storage. When the paste is smooth and uniform it is placed in warm moulds and after cooling the cakes are removed and packed. Gum styrax is obtained from Liquid amber orientalis, a tree found growing in vast forests in the south-west of Asia Minor. In midsummer the outer bark of the tree is bruised and beaten which causes the gum to exude into the inner bark. The inner bark is then stripped off by means of specially shaped knives and boiled with water which causes the gum to separate and float to the top whence it is removed. The partially exhausted bark is then packed in horse-hair bags and subjected to pressure in a somewhat primitive wooden lever press. In order to facilitate the expression of as much gum as possible, hot water is continually thrown over the bags.

3725 L.P.S., Ahmedabad—Pearliness of vanishing cream will appear after a month.

3726 M.C., Neemuch Cantt.—Address of Indian Chemical Manufacturers' Association is 102-A, Netaji Subhas Road, Calcutta. Botanical herbs are imported by Banshidhar Dutt, 126, Khengrapatty Street, Calcutta. Mentha piperita plant may be grown in India. Fresh herb yields 0.4 per cent. oil by water or direct steam distillation. Electricity is not essential for plastic goods manufacture.

3727 M.O.M., Mehod—We have no book dealing with the process of testing the quality of oil left in oil cakes.

3738 D.V.R., Madabavalasa—For the machines required enquire of Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension, Calcutta.

3739 B.V.D., Indore City—You should use acid blue in iron-gallo ink as it contains acid. Other dyes will decompose. You should not use methylene in such ink. Acid dyes are suitable for gallo-iron ink. Letters inserted after the names of dyes denote different brands.

3741 D.K.D., Navsari—Process of bleaching shellac will appear in Formula section in an early issue of Industry. Gum sandarac and shellac are two distinctly different things. Diamond Fuchsine is a kind of dye.

3743 S.N.D., Calcutta—Following is a formula of nitrocellulose lacquer: Nitrocellulose [illegible] lbs.; shellac 5 lbs.; plasticizer 10 lbs.; alcohol 19 lbs.; butyl acetate 40 lbs.; butanol 10 lbs. acetone 5 lbs.; glycol mono acetate 5 lbs.

3744 K.K.G., Bulandshahr—Address of Indo Burma Petroleum Co., Ltd., is 8, Netaji Subhas Road, Calcutta.

3751 A.F.E.C., Malaya—Following is the formulla of solid eau de cologne: Melt together fine soap millings (well saponified) 100 parts; cane sugar 25 parts; water 25 parts; when melted add linalyl acetate 5.5 parts; citronello 6 parts; petitgrain oil 7 parts; rhodinol 2 parts; terpinyl acetate 1 part. Pour the product to moulds and allow to set. It is preferatly put into a metal container for sale, but failing this it should have foil moisture proof wrapping. The addition of menthol to the formula makes the solid cologne cooling in its effect and as an invaluable remedy for headache.

3752 H.M.S., Calcutta—For wool yarn making machine enquire of Oriental Machinery Supplying Agency Ltd., P-12, Mission Row Extension and W. H. Brady & Co., Ltd., Mercantile Bldg., Lall Bazar; both of Calcutta.

3753 M.N.G., Nasik Road — Process of manufacturing biscuits will be found in Home Industries published from this office, price Rs. 3-7 including postage.

3754 A.R., Jodhpur—Following is a list of business magazines: Industry, 22, R. G. Kar Road, Calcutta; Capital, 4, Lyons Range, Calcutta. Commerce Titbits, 26A, Raja Brojendra Street, Calcutta; Indian Finance, 116, Lower Circular Road, Calcutta; Insurance & Finance, 10, Clive Row, Calcutta; Bazar, Hamam Street, Bombay; Business Friend, Parsi Bazar Street, Bombay; Bombay Market, 21, Dadyseth Agiary Lane, Bombay; Commerce, Royal Insurance Bldg., Churchgate Street, Fort, Bombay, and Indian Export Trade Bulletin, Wakefield House, Ballard Estate, Sport Road, Bombay; Following is a list of silk factories: Abdul Karim Silk Mills, 144, Dharavi Road, Bombay; Ambica Silk Mills Co., Ltd., 11-12, Haines Road, Dadar Bombay; Bangalore Silk Filtures Ulsoor Gate, Bangalore 4 and Bangalore Woollen & Silk Mills Co., Ltd., Bangalore City.

3755 K.G., Lucknow—A good formula of disinfectant fluid appeared in March 1949, issue of Industry.

3756 M.S., Cuttack—Agents of Glaxo products are H. J. Foster & Co., Ltd., P.O. Box No. 202, Bombay. For confectionery and lozenges write to J. L. Morison Son & Jones (India) Ltd., G.P.O. Post Box No. 258, Universal Bldg., Sir P. Mehta Road, Bombay 1.

3757 K.L.J., Kuchera—Process of manufacturing sparkler of golden colour will appear in Formula section in an early issue of Industry. Lithopone may be had of Calcutta Mineral Supply Co., Ltd., 31, Jackson Lane, Calcutta.

3758 K.A., Guntur — For emboss printing machines enquire of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

3759 D.A.R., Jammu — You may consult Vegetable Oil Industry published from this office, Rs. 3-7 including postage.

3760 G.C.M., Delhi—Chemicals you require may be had of Calcutta Chemical Co., Ltd., 5, Bonfield Lane, Calcutta.

3761 G.C.M., Delhi—Following is a formula of hair dye: Diamidophenol hydrochloride 150 grms.; sodium sulphite 250 grm.; rectified spirit 100 c.c.; distilled water 900 c.c. Mix. To apply wash the hair with soap to remove oil and grease and dry. Then apply the dye with a soft brush. When the desired shade has developed wash the hair with shampoo.

3762 B.I. Amraoti—Process of finishing stainless steel will appear in Formula section in an early issue of Industry. Process of manufacturing salt will appear in an early issue.

3763 C.J.G.S., Surat—Refer you query to American Trade Commissioner, 9-10, Esplanade Mansion, Calcutta and British Trade Commissioner, 1, Harrington Street, Calcutta.

3764 I.H.W., Pandalapaka — Tape and newar making machines may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

3765 R.S.S., Gwalior—Process of manufacturing metanil yellow, congo red, etc. will appear in an early issue of Industry.

3766 A.C., Rohtak — Please write in English.

3767 R.A.N.S., Dharwar—For selling scented supari you may appoint agents. For this you should advertise in Classified Bargain pages of Industry.

3768 K.K., Delhi—Process of manufacturing rubber shoes will be found in Manufacture of Rubber Goods published from this office, price Rs. 3-7 including postage.

3769 S.C.W., Ahmedabad — Rubber chemicals may be had of Najmuddin Bros., Akber Chamber, Mohamedali Road, Bombay 3. Rubber and rubber latex may be had of Oriental Import & Export Agency, 52, Shrikrishna Nivas, New Silk Bazar, Kalbadevi Road, Bombay and Trades India, Post Box No. 33, Kottayam, Travancore.

3770 D.R., Kamptee—Plastic moulding machines may be had of Francis Klein & Co., Ltd., 1, Royal Exchange Place, Calcutta: Plastic moulding powder may be had of Imperial Chemical Industries (India), Ltd., 18, Strand Road, Calcutta.

3781 S.W., Madras—Benzoin R is a special variety of Benzoin. Dissolve it in alcohol and use as fixative. Gum benzoin is ground finely and mixed with the base. This benzoin is used for fumigation. You should use simple tincture benzoin. You should use 1 oz. rose geranium.

3782 K.P., Bolangir—Put ice in the freezer and stir by handle when the whole mass freezes.

3783 B.I.M.P., Ludhiana—All the ingredients may be had of Banshidhar Dutt, 126, Khengrapatty Street, Calcutta.

3784 G.S.W., Tipur—Process of coconut coir making will be found in Utilisation of Common Products published from this office, price Rs. 3-7 including postage.

3785 V.I.P., Gujrat—Candle moulds may be had of Small Machineries Mfg. Co., 22, R. G. Kar Rd., Calcutta. Thank you for your suggestion.

3786 V.P.G., Banaras—Mix equal parts of alcohol (95 per cent.) and water, make a paste by incorporating the liquid with 300 parts of finely pulverised chalk and 250 parts of starch. This may be used in fixing glass to brass.

3787 P.V.R.R., Ambalur—Process of manufacturing photo paper and chemicals will appear in an early issue of Industry.

3794 T.S.R., Ellore—All the ingredients may be had of Rajaram & Co., 37, Grant Street, Calcutta. Ferrous sulphate, gum arabic, etc., may be had of Banshidhar Dutt, 26, Khangrapatty Street, Calcutta.

3797 M.T., Bombay—You may go through the Journal of Scientific and Industrial Research "P" Block, Raisina Road, New Delhi. Particulars of insulating board from straw are not available. Sugar cane bagasse may be utilised for manufacturing board.

3798 B.L.P., Nagpur — Cigarette making machine may be had of Small Machineries Mfg. Co., 22, R. G. Kar Road, Calcutta. You may consult Indian Tobacco and Its Preparation published from this office, price Rs. 3-7 including postage.

3799 B.R.S., Patiala—Process of manufacturing vanishing cream of different varieties will be found in Manufacture of Toilet Goods published from this office, price Rs. 4-7 including postage.

3800 M.K., Poona—All the chemicals you require may be had of Calcutta Chemical Co., Ltd., 10, Bonfield Lane, Calcutta.

3801 G.S.M.,—Kanpur—You may start ink manufacture with Rs. 500 as initial capital.

3803 M.A.S., Ratnagiri — Toilet making machines may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta.

3804 H.I.S.W.P., Banaras—Process of melting steel is carried on in a special kind of furnace, description of which will be found in Practical Metal Casting published from this office, price Rs. 3-7 including postage. You may also consult Vegetable Oil Industry published from this office, price Rs. 3-7 including postage.

3805 L.K.V., Jaipur—We have no book on glue and gelatine manufacture. You may however enquire of Thacker Spink & Co., (1933) Ltd., 3, Esplanade East, Calcutta.

3807 S.M.P., Shimoga — Process of block making will be found in Independent Careers for the Young published from this office, price Rs. 3-7 including postage.

3808 T.S.R., Ellore—You better take legal advice. There is no arrangement for imparting practical training on printing ink manufacture, pencil manufacture and cigarette manufacture.

3809 M.C.M., Calcutta—Bone black may be had of Calcutta Chemical Co., Ltd., 31, Jackson Lane, Calcutta.

3810 N.L., Kanpur—Plywood cutting machine may be had of Oriental Machinery Supplying Agency Ltd., P12, Mission Row Extension, Calcutta. Handkerchief sewing machine may be

had of Jay Engineering Works, 188, Prince Anwarshah Road, Dhakuria, Calcutta. Plywood may be had of H. Guhat & Co., 22, Canning St., Calcutta and Hindusthan Corporation, 29, Strand Road, Calcutta.

3811 L. B., Purulia—Your letter has been redirected to the party.

3812 S. R. G., Kolhapur—Formulas of luminous paint will be found in February 1950 issue of Industry.

3813 B. I. W., Lucknow—For grinding machine you may enquire of Jessop & Co., Ltd., 93, Netaji Subhas Road, and Francis Klein & Co., Ltd., 1, Royal Exchange Place, Calcutta.

3814 P.C.P.S., Katni—You may consult Industry Year Book & Directory published from this office, price Rs. 16-4 including postage.

3815 K.C.N., Kanpur—Following is formula of ink tablet: Methylene blue 4 oz; methyl violet ½ oz; gum acacia powder ½ oz; sugar ½ oz; boric acid 1 dr. Mix and add sufficient quantity of water to make a paste. Dry in the sun, when dry break into small grains which should be fed to the tablet making machine. Process of rubber stamp making will be found in Manufacture of Rubber Goods published from this office, price Rs. 3-7 including postage.

3816 P.H., Surat—We have no book on textile weaving. You may however enquire of Thacker Spink & Co. (1933), Ltd., 3, Esplanade East, Calcutta.

3822 G.S., Bombay—Process of manufacturing casein will be found in Milk and Milk Products published from this office, price Rs. 3-7 including postage.

3823 C.E.S., Pannipetiva—You may consult Manufacture of Slate: Milk and Milk Products; Manufacture of Antiseptics and Disinfectant. Process of manufacturing pipe tobacco, French polish, etc., will appear in an early issue of Industry.

3824 J.N.M., Amritsar—We have no book on hosiery bleaching, you may however enquire of Thacker Spink & Co. (1933), Ltd., 3, Esplanade East, Calcutta for the book.

3826 B.R.C.P., Ajidu—Process of manufacturing fountain pens will be found in Mechanical Industries published from this office, price Rs. 3-7 including postage. Ebonite rods may be had of Western Indian Manufacturers Agency Ltd., P.O. Box No. 574, Bombay; Universal Traders, 92, Harrison Road, Calcutta and New Calcutta Stores, 52, Strand Road, Calcutta.

3827 N.A.S.S., Bellary—Process of manufacturing orange squash, etc., will appear in an early issue of Industry.

3828 U.S.P., Rai Bareli—Following is a formula of asphaltum varnish: A solution of 1 part of caoutchouc in 16 parts of oil of turpentine or kerosene is mixed with a solution of 16 parts of copal in 8 parts of linseed oil varnish. To the mixture is added a solution of 2 parts of asphalt in 3 or 4 parts of linseed-oil varnish diluted with 8 or 10 parts of oil of turpentine, and the whole is filtered.

3829 J.P.S.C., Ranchi—Process of making straw board slates will appear in an early issue of Industry.

3830 H.M.Z., Vaniyambadi—[illegible] tamarind seed and powder and glue [illegible] powder advertise in newspapers.

3831 R.V.S., Gwalior—For wov[illegible] making machine enquire of W. H. Brad[illegible] Ltd., Mercantile Bldgs., Lall Bazar, [illegible]cutta.

3832 O.P., Dehradun—You may consu[illegible] dian Trade Journal published from Civil L[illegible] New Delhi. All the addresses you require [illegible] be found in Industry Year Book & Direct[illegible] published from this office, price Rs. 16-4 [illegible]cluding postage.

3833 S.K.G., Muzaffarpur—An article o[illegible] laundry appears in February 1950 issue of In[illegible]dustry. For dry cleaning pure petrol is use[illegible] We cannot advise you on removing salin[illegible] deposits on masonry work. You better consu[illegible] an engineer.

3834 M.C., Shujabad—Process of manufa[illegible]turing Keora water by synthetic process is n[illegible] available. You may use any kind of otto ro[illegible] and essence musk available in the market. [illegible] is not possible to make cubes on large scal[illegible] with any machine. Following is a formula [illegible] jintan. Menthol 16 gr; sugar 10 oz; liquori[illegible] 50 oz; otto of rose q.s.; musk 1 to 2 gr. Fir[illegible] grind the liquorice into very fine powder an[illegible] then mix it thoroughly with sugar in a sto[illegible] mortar. Then add the menthol and make in[illegible] small globules. Finally add the musk an[illegible] otto of rose just sufficient to form a delightf[illegible] odour.

3835 S.E.M.H.S., Colombo—An article o[illegible] cattle food manufacture appears in Februa[illegible] 1950 issue of Industry.

3836 R.C.W., Karkola—For cycle parts e[illegible]quire of Crescent Cycle & Motor Co., 158, Dh[illegible]ramtola Street, and India Cycle Manufacturi[illegible] Co., Ltd., 9, Tiljala Road, Calcutta.

3837 S.R.M., Kumbakonam—You bett[illegible] consult an expert on pyrotechny. For such [illegible] expert you should advertise in Industry.

3848 S.K.S., Delhi—Following is a list [illegible] gum arabic dealers: Banshidhar Dutt, 1[illegible] Khengrapatty Street; P. C. Dawn & Co., [illegible] Mechuabazar Street and Indian Herbs Store, [illegible] Mullick Street; all of Calcutta.

3849 R.C.R., Hazaribagh—You may consu[illegible] Indian Perfumes Essences and Hair Oils pu[illegible]lished from this office, price Rs. 3-7 includi[illegible] postage.

3851 M.B., Upleta—An article on too[illegible] paste manufacture appears elsewhere in th[illegible] issue.

3852 S.L.S., Peddapuram—It is not po[illegible]ssible to deodorise jaggery.

3853 G.C., Nagpur—Process of manufactu[illegible]ing green oxide colour will appear in an ear[illegible] issue of Industry.

3854 B.N.R., Rohini—For the books y[illegible] require enquire of the following firms:—D[illegible] Gupta & Co., 54/3, College Street; Hin[illegible] Pracharak Pustakalaya, 195-1, Harrison Roa[illegible] M. C. Sarkar & Sons Ltd., 14, College Squa[illegible] and R. Cambray & Co., Ltd., Kent House, P-[illegible] Mission Row Extension; all of Calcutta. F[illegible] Govt. publications enquire of Govt. of Indi[illegible] Central Publication Depot., 8, Hastings Stre[illegible] Calcutta.

S.M.S.B., Bhal[illegible] Ltd., 7/1, Hide Road, Kidderpore, Calcutta and [illegible] Tar Producers' Association, 20, Strand Road, [illegible]acco and its [illegible] Calcutta. Essences and Hair Oils [illegible] price Rs. 3-7 each including office.

3874 H.P.C., New Delhi—Process of transfer label making will appear in an early issue of Industry.

B.M.S., Brohmavar—Refer your query [illegible] P. Poultry Association, Lucknow, U.P.

[illegible] B.L.A., Bombay—You may use mag[illegible] as binding medium. Mixture should be [mag]nesium chloride and magnesite.

[38]58 M.C., Neemuch Cantt. — You may [communic]ate with Indian Chemical Manufacturers [Assoc]iation, 102A, Netaji Subhas Road, Calcutta. [A]ddress of Indian Institute of Science is [Ban]galore. Plastic industry may be started on [smal]l scale without any power.

3868 O.P., Mathura—If you find any diffi[cul]ty in manufacturing any article according to [the] formulas and processes published in [In]dustry please refer to us when we shall give [yo]u further instruction.

3869 G.D.S., Kanpur—Following is a list of [ha]ndwoven cloth manufacturers. Dhanalakshmi [W]eaving Works, Kakkat. Cannanore; Kerala [W]eaving Co., Chovva, Cannanore; Monohara [W]eaving Works, Chovva, Cannanore; Prince [W]eaving Works Ltd., Mynatappakulam Street, [M]adura.

3870 R.I.C., Parbatsar—We have no book [d]ealing with minerals. You may however go [t]hrough Annual Report of the Geological Survey [o]f India to be had of Government of India [C]entral Publication Depot., 8, Hastings Street, [C]alcutta.

3871 E.T.C., Tiruchirapalli — Process of [m]anufacturing coffee tablets, bias binding, tin [p]late will appear in an early issue of Industry.

3872 A.A.G., Dhrappa—A good formula of [s]now appeared in Oct. 1948, issue of Industry. Following is a list of fountain pen dealers; [A]garwal & Sons (1946) Ltd., 428, Kalbadevi [R]oad, Bombay; Hornby Fountain Pen Depot., National Insurance Bldg., 204, Hornby Road, [B]ombay. You may go through Plastic Industry [p]ublished from this office. Cardboard boxes may [b]e had of Central Paper Box Factory, Patel [B]ldg., 250, Nagdevi Street, Bombay and Gogate [P]aper Box Works, Princess Street, Bombay. For [w]ire enquire of A. A. Dehgamwala, 58, Khokha [B]azar, Bombay and Bombay Wire & Metal [P]roducts, 272-2, Musjid Bunder Road, Opp: [I]mperial Bank, Bombay 3.

3873 S.M.S.B., Raipur — For asphalt and [c]oaltar enquire of Bitumen Emulsions (India)

3877 K.C.S., Kanpur—For asphalt enquire Bitumen Emulsions (India) Ltd., 7/1, Hide Road, Kidderpore, Calcutta. Woodpulp paper may be had of Bengal Paper Syndicate, 14/2, Old China Bazar Street, Calcutta.

3878 C.P.D., Kanpur—For a book on salt refining you may enquire of Thacker Spink & Co., (1933) Ltd., 3, Esplanade East, Calcutta.

3879 R.T., Kanpur—You may use rectified spirit but, if it is not available at all you may use benzylbenzoate; proportion should be 2 dr. benzylbenzoate in one pound tooth powder.

3883 N. Amritsar—Process of manufacturing caustic soda will be found in Chemical Industries of India published from this office, price Rs. 3-7 including postage.

3885 P.V., Hyderabad—You may write to the Registrar of Calcutta, 5, Government Place North, Calcutta.

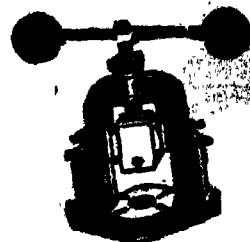
3886 M.C.M.A., Ahmedabad—Process of refining groundnut oil and making Vanaspati will be found in Vegetable Oil Industry published from this office, price Rs. 3-7 including postage.

3887 G.H., Rawalpindi—You may use caustic potash and potassium silicate which may be had of Calcutta Chemical Co., Ltd., 10, Bonfield Lane, Calcutta.

3888 N.F., Mathura—In order to harden the casting the castings are packed in powder beryllium-iron (80 per cent. beryllium) and heated at 800 to 1150°C for 2½ to 10 hours.

3889 S.B.S., Trivandrum — Candle making machines may be had of Small Machineries Mfg: Co., 22, R. G. Kar Road, Calcutta.

3897 B.P.A., Bulandshahr—Reply to your query appears under No. 3655. You may consult Manufacture of Soap published from this office, price Rs. 3-7 including postage.

3898 P.C.K., Lucknow—Following is a formula of scented castor oil: Castor oil 16 oz.; rectified spirit 8 oz.; nutmeg oil 10 drops; neroli oil 10 drops; otto rose 20 drops; essence of musk 1 dr.; alkanet root ½ oz. *Mix the* alkanet root with castor oil and keep aside for a day or two. Then strain through a cloth and mix the other ingredients one by one into the oil. Shake vigorously after each addition and then keep for 4 days, when it will be ready for use.

—REVIEW OF BOOKS

OUR FOOD PROBLEM by J. C. Kumarappa. Published by the All-India Village Industries Association, Maganvadi, Wardha (C.P.). Pages, 182, Price, Rs. 1/8/-.

Mr. Kumarappa is a well-known exponent of the principles of Gandhian economy and the articles comprising this book which originally appeared in "Gram Udyog Patrika" deal with the problems of food and our agricultural economy from the Gandhian standpoint. Everywhere the stress is on simplicity and freedom. The author urges an exploitation of the indigenous resources and decries the present vogue of depending so much on external goods and services. He is of the opinion that India can hardly afford the costly luxury of experimentation on the western methods. Her greatest need is to turn the searchlight inwards and re-discover herself.

The author is very loud in his condemnation of the machine and the factory. He discourages the use of artificial food products. He considers the use of chemical fertilizers as harmful to our soil and recommends the use of indigenous organic manures. The author disapproves of mechanization of agriculture and of the building of food industries in India. In his opinion all preference should go to the cultivation of food crop in view of the acute food scarcity in the country.

All of Mr. Kumarappa's views are not necessarily sound or worth accepting, but certainly they can provoke thought, coming as they do in the shape of a challenge. Take for example, his views on the abolition of zemindari by pensioning off the zemindars with compensation. He thinks that kind of a measure is not necessary at all. According to him "the course that should be adopted would seem to be to place the cultivable lands in villages, to whomsoever it may belong, under a system of balanced cultivation, by which the requirements of the village for a balanced diet and other primary necessities will be produced in the required quantities. Under this scheme the land will be licensed for growing the products that are necessary to ensure the needs of a group of village with a population of about 1,000. Such lands when licensed, should be cultivated for a period of 2 or 3 years without adequate reason, such lands should revert to the State and the State can then re-distribute those lands amongst the villagers, who are willing to utilize the land to produce commodities according to plan, for balanced cultivation".

THE ECONOMIC PROSPECTS OF CHEMICAL INDUSTRIES IN INDIA by A. K. Madan, M.Sc. Tech. Published by Thacker & Co., Ltd., Rampart Row, Bombay. Pages, 482, price, Rs. 20.

The author of this book is a practicising Chemical Engineer and Technical Director of a well-known firm of Chemical Manufacturers. The present treatise is a product of first-hand experience and study extending over many years. It is a study of industrial development in India up-to-date with special reference to chemical industries, the expansion of which is so intimately related to the expansion of all other industries.

The book opens with a historical survey and the author is well aware of our too many industrial drawbacks. Casting aside the attitude of complacency, more often than not the only capital of our politicans, Mr. Madan reminds his countrymen of the stupendous task of national reconstruction lying ahead of them. He praises the work so far done by the Scientific and Industrial Research Board set up during the war. The Board well merits the praise as it has served the purpose of promoting industrial and technical knowledge in the country. Commenting upon the present industrial set-up in India the author says, "The industry in India is in such a disorganised state of individuality that it is difficult to speak of the potentialities of the country. The first and the foremost task of the planners is to develop the various resources of the country by giving due importance to both mineral and agricultural products. India is sufficiently rich in these products and one can claim to plan soundly the post-war India into an Industrial India. There is no dearth of minerals in India and there is ample scope for developing various industries from them. Most of the resources of the states have still remained unexplored. In fact, there is need of a team of geologists to explore the hidden treasures of the earth for industrial purposes".

According to the author, the various industries that can be developed in the country are, for example, the manufacture of mineral acids; fertilisers; heavy chemicals, B.P. and fine chemicals; drugs; paints and varnishes; electroplating chemicals; photographical chemicals; dyes and colours; synthetic resins; oils, fats and wax; various qualities of cement; etc. He is right in holding that the success of the above industries can only depend upon sound planning.

The book gives an exhaustive survey of the various minerals available in the country and states their industrial uses. Rough estimates of cost and production figures of minerals are given along with references to their utility and scope for export. Agricultural products including both money and food crops are dealt with and there is a very illuminating study of India's power resources and the possibilities and scope of their development.

The chapters dealing with chemical industries are packed with all necessary details about (1) Heavy Chemicals including sulphuric and allied chemicas, Alkalies, and a large number of other chemicals; (2) Fertilisers and Ammonium Salts; (3) Fine Chemicals; (4) Electroplating Accessories and Electro Chemicals; (5) Photographic Chemicals; (6) Dyestuffs and textile auxiliaries; (7) Explosive Chemicals;

(5) Plastics; etc. The Appendix contains a pretty long list of the chemicals used in the various industries and statistics of export, import and production. Even a cursory glance at Mr. Madan's well written informative book is sure to convince the reader about its usefulness. It is just the work for which chemical engineers, technicians, planners, business enterpreneurs and economists have been waiting for long.

In conclusion, we should refer to the two concluding chapters of the book dealing with the problem of labour welfare in chemical industries and technical education. In the industrially advanced countries of the world the present tendency is to replace man by machine wherever possible. We can hardly afford to go the same way in our country as we have to provide employment to our vast and ever increasing population. In chemical industries we shall have to employ skilled hands and see to it that they work under proper conditions of efficiency and caution. Since labour in chemical industries is technical in character, their wages ought to be higher than in other industries. One can hardly disagree with the author that labour engaged on high temperature furnaces ought to get special salaries and privileges. Dealing with technical education the author regrets the absence of adequate facilities for it in this country and urges speedy development of the same as the foundation stone of India's industrial progress yet to be achieved on any perceptible scale.

GENERAL REPORT OF THE METAL TRADE COMMITTEE, I.L.O. To be had of the International Labour Office, Indian Branch, New Delhi.

This Report of the I.L.O. contains two chapters, one dealing with the action taken by the various Governments on its recommendations and the other giving a very detailed and informative review of the position of metal trades in the many different regions of the world to-day.

The Metal Trades Committee at its second session held in Geneva in September 1947, declared that its primary objective was to contribute to the improvement of the standard of living of the workers in the metal trades. This objective could be attained by regularisation of production and employment at a high level. As it was felt that for this purpose it would be necessary to undertake studies in each country of a number of problems connected with the metal trades, the Governments represented on the Metal Trades Committee were asked to consider the advisability of setting up suitable agencies to gather and analyse the necessary data and formulate recommendations regarding the problems affecting the metal trades for the information of the country as a whole and for the guidance of the industry and of the appropriate Governmental bodies.

Chapter II. of the Report reviews the evolution of the metal trades of the world since before the war against the general background of economic developments and efforts at reconstruction. It is pointed out that even though the review may appear extensive, it does not prov[illegible] more than a condensed outline of developme[nts] in the principal branches of the metal trades.

As the section dealing with India may [be] of particular interest to our readers we [re]produce it in brief in these columns. "T[he] Advisory Planning Board set up by the Gover[n]ment of India on 26 October, 1946, recommend[ed] planning on a broad basis only. On the questi[on] of priority the Board recommended that fi[rst] preference should go to advanced industries a[nd] to those related to prime necessities such [as] food, clothing, housing, coal and transport [as] well as to irrigational and hydro-electri[c] developments, iron and steel, and chemica[ls]. The manufacture of machinery, it was suggeste[d] should be given second preference. For t[he] development of large-scale industries it w[as] recommended that the central and region[al] Governments should work with a common pla[n]. The Board recommended that no plan of econo[]mic development should leave out the country['s] large number of cottage industries which pr[o]vide employment to our millions of rural i[n]habitants. Development plans are to a lar[ge] extent limited by the probable production a[nd] demand for basic materials for the five yea[rs] commencing 1947. Steel requirements are par[ti]cularly high. The railway plans alone w[ill] call for an amount equal to half the country['s] present production. It is anticipated th[at] steel deficits will continue to be half a milli[on] tons per year for the next three years. Amo[ng] India's new industries mention is made of shi[p]building and Locomotives industry. The Go[v]ernment is giving active consideration [to] shipbuilding and the present target [is] 50,000 gross tons per year by the e[nd] of 1950. The Locomotives works at Ch[it]taranjan which opened on January [] 1950, aim at an eventual capacity of 120 locom[o]tives and 50 spare boilers per year. The Ta[ta] Locomotives at Jamshedpur are expected to [go] into production by 1952. This factory w[ill] supply half of India's yearly locomotive need[s]."

GENERAL REPORT OF THE IRON AN[D] STEEL COMMITTEE, I.L.O. To be had of th[e] International Labour Office, India Branch, Ne[w] Delhi.

This Report of the I.L.O's Iron and Ste[el] Committee consists of three chapters. Chapt[er] I is a review of action taken in the variou[s] countries and by the I.L.O. on the recommend[a]tions of the Second Session of the Committe[e]. Chapter II reports on the studies and enquirie[s] undertaken by the Office at the request of th[e] Committee. Chapter III is a study of recen[t] events and developments in the Iron and Ste[el] Industry.

Speaking of the supply and demand positi[on] the Report says that demand for steel throug[h]out the world has remained at a very high lev[el] and it has been impossible to satisfy the demand of the steel using industries. Dealing with th[e] production position the Report gives an i[n]formative summary of the present supply pos[i]tion of the raw materials of the industry. Ther[e] has been some perceptible increase in employ[ment]

ment as well as in production. The Appendix gives production and labour statistics for 1947, 1948 and for 1949 upto June, on a countrywide basis. The progress of labour welfare schemes in the Iron and Steel industries of the various countries has been outlined in Chapter III. Among events of special interest references are made in the Report to the U.K. Iron and Steel Mill relating to nationalization and the "Basing Points" controversy in the United States.

NOTICES & REVIEWS

(Manufacturers sending specimens and samples of their products for notice and review may please note that no notice is published of medical preparation and allied substances in this section.)

RUBBER STAMP PAD

We are glad to receive one Kamal Stamp Pad manufactured by B. D. K. Co., of 22/1/1, Jellatola Street, Calcutta 6.

In comparison with other Indian products of a similar nature this Pad possesses some special features. It retains its bright tint and moist consistency to the last and the pad does not dry up even on long storage or in hot season. The get-up is quite novel with a charming and attractive design. We recommend it to all users of Rubber stamp and dealers in stationery articles.

HANDBOOK OF TEXTILE INDUSTRY 1949

We are glad to receive a copy of Handbook of Textile Industry 1949, published by the Bureau of Economic Research, Post Box 45, Kanpur, Price Rs. 15/-. In addition to the useful commercial and technical information, several new statistics and useful tables have been added. Additional information incorporated in the present edition includes brief reviews of different textile centres of India and Pakistan with all the available statistical informations.

The financial position of the individual units (Review of Balance Sheet) has also been brought up-to-date. In a concise form, one is able to get a succinct idea of the progress of our Textile mills (including cotton, jute, silk, wool etc.), as also the working of the important Stock Exchange like Bombay, Calcutta and Madras is very interesting and will be useful to those who want to deal in stocks and shares of the Textile Companies. The chapter on the Technical and Technological education which is also a new feature giving useful details of every institution including the carricula, course of studies, etc., will be of particular interest to our young men aspiring to take up textile line as their future career.

The Who's Who Section also contains several new addition and now embraces all important textile mills and units in the country.

In short this handbook is a veritable mine of information for all those who may have occasion to refer frequently to reliable datas of textile trade.

JARI

We have received samples of good quality Jari from Ishverlal N. Umratwala (Jariwala), Begumpura, Amkhas Naka, Chalima, Surat.

A HOMOEOPATHIC MONTHLY

We have received a copy of the inaugural issue of "Modern Medicine," a monthly magazine devoted to electro complex homoeopthy. It is published by the Central E. C. Homoeopathic Co-operative Society Ltd., Nayaganj, Kanpur, U.P. Its annual subscription is Rs. 5/-.

NEW YEAR CALENDARS

We are glad to acknowledge new year calendars from the following:—Utkal Chemical & Oil Industries Ltd., Puri, Orissa; National Nursery, 46, Ramdhone Mitter Lane, Calcutta; Ranajit Engineering Works, 20, Chitpur Bridge Approach, Calcutta 3; The Print & Paper (Sales), 4/7A, Waterloo Street, Calcutta; Indian Metals & Alloys Co. Ltd., Sole Agents Heatly & Gresham Ltd., Hide Road, Calcutta 23; Silvertown Lubricants (India) Ltd., P13, Mission Row Extension, Calcutta; D. K. Das & Co. Ltd., 238, Belilios Road, Howrah; P. K. Sen & Sons (India) Ltd., 105/1, Ultadanga Main Road, Calcutta 4; The Symposium Publicity & Propaganda Service, 22, R. G. Kar Road, Calcutta and Chemical Agents Ltd., Calcutta.

PULP TOYS

We have received from Jagdish Prashad Shah, 10, Murlidhar Sen Lane, Calcutta 7; samples of unbreakable pulp toys attractive in designs, very much pleasing to small children.

TRADE ENQUIRIES

(To communicate with any party write to him direct with name and address given below mentioning Industry).

3492 J.V. Rodrigo, 91, Fourth Cross Street, Colombo, Ceylon—Wants to be put in touch with the manufacturers of real enamel photo stones, photo monuments and photo enlargements.

3529 J. Haldar, 22-1-1, Jelliatola Street, Calcutta—Wants to be introduced to Indian manufacturers of white opaque cellulose capsules for small phials.

3557 Erappa, Ragi Mandi, Santhepet, Mysore Wants to be put in touch with the suppliers of toor and toor dall of Central Province.

3592 A. Subrahmanya Iyer & Sons, Harohalli, (Via Bidadi), Bangalore—Want to be put in touch with the suppliers of chicory powder of Holland and Denmark.

3720 V. Srinivasan, 23/C, Sardar Sankar Road, Calcutta 29—Wants to be put in touch with the suppliers of asbesos fibre in the Punjab, U.P., C.P. and Cuddapah.

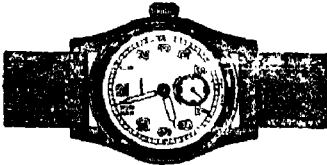
3742 P.V., Ramachandra Row, Eklaspuram, Ambur P.O., Via Jalarpet—Wants to be put in touch with fruit juice dealers at Madras, Bombay, Delhi and Calcutta.

3858 Malani & Co., Neemuch Cantt., B.B. & C.I. Ry.—Want to be put in touch the manufacturers of wool carding machines of Panipat.

3860 S.P. Muthuswamy Pillay & Sons, Tuticorin—Want to be put in touch with the suppliers of deer and stag horns.

The below noted goods are of genuine Swiss origin intended for distinguished buyers. On the prices marked against each item a discount of 25 % is allowed. Added a life-time American fountain pen fitted with a solid gold nib will be awarded FREE to buyers ordering for any three pieces of watches at a time to be supplied in one single consignment. Every watch carrys with it a fine strap and a decent watch-case as also a "Guarantee Certificate" for a period of three years. Goods are supplied per Value Payable Parcel—

Cat. No.	Size	Particulars.	Price per pc. Rs.	A.
206	6¾″	Rolled gold steel-back, Tonneau, White dial 15 jewels	104	0
207	6¾″	Rolled gold steel-back, Tonneau, white dial with optic glass 15 jewels -- --	108	0

Cat. No.	Size	Particulars.	Price per pc. Rs.	A.
210	7¾″	Full Rolled gold, Curved fancy dial 15 jewels --	84	0
211	7¾″	Rolled gold steel-back, curved fancy dial 15 jewels --	80	0
212	7¾″	Chrome steel-back, curved Fancy Dial, 15 jewels --	72	0

Cat. No.	Size	Particulars.	Price per pc. Rs.	A.
213	10½″	Rolled gold steel-back, Round Fancy Dial, 15 jewels --	80	0
214	10½″	Chrome steel-back, Round Fancy dial 15 jewels --	68	0
215	10½″	Rolled gold steel-back, Round with centre second 15 jewels -- --	84	0
216	10½″	Chrome steel-back, Round with centre second 15 jewels --	72	0

Cat. No.	Size	Particulars.	Price per pc. Rs.	A.
224	10½″	Chrome case, stainless-steel back, Round with centre second, Water-proof, shock absorber, Antimagnetic, Radium Dial, 15 jewels -- --	92	0
227	10½″	Steel case, Round with centre second, All proof Fancy Radium Dial, 17 jewels --	128	0

Cat. No.	Size	Particulars.	Price per pc. Rs.	A.
225	8¾″	Steel-case, small round with Centre second, Water-proof, shock absorber, antimagnetic, Radium Dial 15 jewels --	140	0

Cat. No.	Size	Particulars.	Price per pc. Rs.	A.
228	5¼″	Rolled gold steel-back, square optic glass with thick cord, fancy loops 15 jewels --	104	0
229	5¼″	Chrome steel-back, square optic glass with thick cord, fancy loops 15 jewels --	96	0

Cat. No.	Size	Particulars.	Price per pc. Rs.	A.
230	5¼″	Rolled gold steel-back, Rectangular, wire-loops, fancy-dial 15 jewels -- --	100	0
231	5¼″	Chrome steel-back, Rectangular, wire-loops, fancy dial 15 jewels -- --	92	0

TELEGRAMS: "TICK TICK"

LORENZO WATCH COMPANY,

163, NAGDEVI CROSS LANE, BOMBAY-3.

Edited, Printed & Published by K. N. Banerjee, for Industry Publishers Ltd., at the "INDUSTRY PRESS" [illegible] Calcutta-4.